

INNOVATION & ENTREPRENEURSHIP DEVELOPMENT CENTRE

Funded by,
Department of Science and Technology, New Delhi

Activity Report

Year 2015



INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA
Y-12, Saltlake Electronics Complex, Sec-V, Kolkata-700074



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Innovation and Entrepreneurship Development
Centre, IEM, Kolkata

CHAPTER-1

IEM IEDC 2015, OVERVIEW



Innovation and Entrepreneurship Development
Centre, IEM, Kolkata

CHAPTER-1.1

IEM IEDC ADVISORY BOARD



Innovation and Entrepreneurship Development Centre, IEM, Kolkata



**INSTITUTE
OF ENGINEERING & MANAGEMENT**
Salt Lake Electronics Complex, Calcutta - 700 091, INDIA

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Webpage : www.iemcal.com
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(033) 2357-8189/8908/5389

No. IEM/Project/IEDC Meeting/2015

Date: 3rd March, 2015

NOTICE

To : All members of IEDC Advisory Board

The 1st meeting of the IEDC Advisory Board of Institute of Engineering & Management, Kolkata will be held on 21st March, 2015 at 2.00 p.m. in the office of the Principal, IEM to discuss the following agenda:

1. Welcome of Board Members by the Chairman
2. Brief introduction about IEM IEDC cell -
 - 2.1. About IEDC cell
 - 2.2. The activities of IEDC cell in Institute
 - 2.3. IEDC Cell administrative structure
 - 2.4. Policy of the Institute on IEDC Cell
3. Project Status review
4. Inclusion of other members
5. Future Roadmap
6. Miscellaneous – with the permission of the Chair.

All members are requested to attend the meeting, share your valuable opinion and suggestion.

Prof. Avijit Bose
Coordinator of the IEDC Project

To:
Dr. A. K. Nayak, Principal- Chairman
Dr. K. K. Ghosh,
Mr. Sanjay Ray, GM, R&D, NPIL Ltd.
Dr. Manas Sanyal, HOD, HRM, IEST
Mr. Subhabrata Bhattacharya, NEN
Dr. Rajib Ganguly – Member Secretary
Mr. A. K. Datta, FA&CAO



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Minutes of the 1st Advisory Board Meeting of IEM-IEDC held on 21st March, 2015 at
2.00 p.m. in the office of the Principal, IEM, Kolkata

The following members were present during the meeting :

Dr. A. K. Nayak, Principal- Chairman
Dr. K. K. Ghosh,
Mr. Sanjay Ray, GM, R&D, NPIL Ltd.
Dr. Manas Sanyal, HOD, HRM, IEST
Mr. Subhabrata Bhattacharya, NEN
Dr. Rajib Ganguly – Member Secretary
Mr. A. K. Datta, FA&CAO

The Chairman Prof. Dr. Amlan Kusum Nayak welcomed all the members of the board.

Agenda No.2:

The Chairman gave a brief introduction about IEDC cell and how it would help the Institute to grow in the future for development in the field of innovation and entrepreneurship development.

He introduced board members with each other and explained their responsibilities. He also informed about the administrative structure of the cell.

It was discussed as to how IEDC cell focuses on R&D activities in the Institute and how it is spreading entrepreneurship culture among the students.

In this regard, the members had given stress on a clear policy on IEDC Cell and how the project can be improved further. Those products need to be packaged well and commercialized. It was also explained how the Institute needs to build up ecosystem for commercialization of the products.

Agenda No.3:

The status of the existing projects had been reviewed, which are as under :

PROJECT NAME	STATUS
Blind-man Assistance System	Prototype Complete
Wireless Printer	Prototype Complete
Bluetooth Controlled switchless home	Prototype was not complete.
Foul Detection System	Prototype was complete
Smart home security system	Need few modification

Contd.....2/



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Agenda No.4:

After review of the projects, it was resolved that new members would be inducted in the Board, especially from the industries and various government agencies, who can provide support to students for implementation, so that strong industrial bonding could be developed.

Agenda No.5:

It was discussed that the future roadmap of IEDC Cell and how it can be transformed into incubation center for all the interested students had been explained. A site for IEDC Cell is to be prepared separately to popularize amongst the student, academia and industries.

Chairman of the IEM-IEDC Board

Date: 22/3/2015



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CHAPTER-1.2
IEM IEDC 2015, UTILIZATION
CERTIFICATE



Innovation and Entrepreneurship Development Centre, IEM, Kolkata

UTILISATION CERTIFICATE

For the financial year ending 31st March,2015

- 1.Title of the project/ scheme: Innovation and Entrepreneurship Development Centre (IEDC)
- 2.Name of the organization: Institute of Engineering & Management, Kolkata
- 3.Principal Investigator:
- 4.Department of Science & Technology Letter No. IFD/2056/2014-15 dated 09.07.2014 and
and date Sanctioning the project. IFD/2080/2014-15 dated 10.07.2014
- 5.Amount brought forward from the previous
financial year quoting DST Letter No. and date
in which the authority to carry forward the said
amount was given: NIL
- 6.Amount resolved from DST during the Financial year
(please give no. and dates of sanction showing the amount
Paid: Rs. 13,30,000.00
- 7.Total amount that was available for expenditure:
(excluding commitments) incurred during the financial year
(sl no.5+81, No.6): Rs.13,30,000.00
- 8.Actual Expenditure (excluding commitments) incurred
during the financial year: Rs.17,60,126.77
- 9.Unspent Balance refunded if any (please give details of
cheque no. etc.): Rs. NIL
- 10.Balance amount available at the end of the financial year: Rs.NIL
- 11.Amount allowed to be carried forward to the next
financial year vide letter no.: Rs.NIL



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certified that the expenditure of Rs.17,60,126.77 (Rupees Seventeen Lacs Sixty Thousand One Hundred Twenty Six and Seventy Seven Paisa) only mentioned in Col.8 was actually incurred in the project/scheme for the purpose for which it was sanctioned.

Date: 07/05/15

Signature of Principal Investigator



Signature of Registrar/

Accounts Officer
Prof. A. K. DATTA
F. A. & C. A. O.
Institute of Engineering & Management
Salt Lake Electronics Complex
Kolkata-700 091

Signature of the head

of the Organisation
Prof. Dr. A. K. Nayak
Principal
Institute of Engineering & Management
Sector-V, Salt Lake Electronics Complex
Kolkata-700 091

ACCEPTED AND CONTERSIGNED



Innovation and Entrepreneurship Development Centre, IEM, Kolkata

DEPARTMENT OF SCIENCE AND TECHNOLOGY

NEB DIVISION

PROFORMA FOR STATEMENT OF AUDITED EXPENDITURE

NAME OF THE GRANTEE INSTITUTION: INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

ADDRESS: Y-12, BLOCK-EP, SECTOR-V, SALT LAKE ELECTRONICS COMPLEX, KOLKATA-700091

NO. OF DST SANCTION LETTERS

DATE OF ISSUE

AMOUNT

IFD/2056/2014-15 dated 09.07.2014

8,00,000.00

IFD/2080/2014-15 dated 10.07.2014

5,30,000.00

PURPOSE OF GRANT: Setting up of Innovation and Entrepreneurship Development Centre (IEDC)

Sl.No.	Items of Expenditure (in the same order as given in sanction)	Sanctioned expenditure	Actual expenditure	Variation (excess/shortfall)	Reasons justification for variation
1.	Students Project	5,00,000.00	5,39,435.77	39,435.77	
2.	Contingencies(phone, fax, stationery, travel and honorarium to coordinator of IEDC etc.	3,00,000.00	7,59,559.00	4,59,559.00	
3.	Computing Facilities	80,000.00	48,980.00	-31,020.00	
4.	Laptop	50,000.00	49,500.00	-500.00	
5.	LCD Multimedia projector	1,00,000.00	1,00,076.00	76.00	
6.	Office Storage Devices	50,000.00	16,060.00	-33,940.00	
7.	Library Books and journals	2,50,000.00	2,46,516.00	-3,484.00	
Total					17,60,126.77

(Rupees Seventeen Lacs Sixty Thousand One Hundred Twenty Six and Seventy Seven paise) only.

Signature of head
Of the institution with
Rubber stamp

Prof. Dr. A. K. Nayak
Principal
Institute of Engineering & Management
Sector-V, Salt Lake Electronics Complex
Kolkata-700 091

Signature of
Programme
coordinator
With rubber stamp



Signature of
Finance &
Accounts officer of
institute with rubber stamp

Prof. A. K. DATTA
F. A. & C. A. O.
Institute of Engineering & Management
Salt Lake Electronics Complex
Kolkata-700 091

Signature & rubber stamp
of the Auditor M.No: 64604
113A A S C Bost RD
Kolkata-700 091



Innovation and Entrepreneurship Development
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CHAPTER-2

IEM IEDC 2015, ENTREPRENEURSHIP ACTIVITY OF 2014-15



ENTREPRENEURSHIP ACTIVITY OF 2014-15

1. Faculty Training

IEDC faculty Mr. Avijit Bose attended courses organized by IEM, NEN and other Organizations. The Details are as follows:

- **Business Skill Development Program** collaboration with MSME Institutions of duration 1 month. Speakers from MSME Institutions trained IEM Faculties to acquire leadership in Business Management and Entrepreneurship.
- **Faculty Development Program on “Entrepreneurship Teaching Methodologies”** November 28th, 2014 Three days workshop on Effective teaching skills for enhancing the teaching process.

2. Seminars and Workshops:

- **Workshop on RTI Act - IEM & TCS** (2 days) delegates from Industry, students & Faculties it was Helpful guidelines for RTI Acts.
- **National Conference on “EMERGING GREEN TECHNOLOGIES”** Industry & Institutions (2 days) conference with Industries and Institutions to increase the research and development activity.
- **Seminar on Intellectual Property rights IEM & Tata Consultancy Limited** (1 Day) Mr. Debasish Bandopadhyay trained faculty It was Useful for understanding IP rights.



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- **Seminar on Intellectual Property rights IEM & Tata Consultancy Limited (1 Day)**
Mr. Debasish Bandopadhyay for students and faculties It was Useful for understanding IP rights.

Students Activity:

IEM-IEDC Cell organized many students event to spread the spirit of Entrepreneurship in IEM. They are as follows:

- **A PATH TO WEALTH CREATION**

In the capacity of an entrepreneur, the individual retains more control of time, earnings and creativity. Being a self-employed entrepreneur increases the potential for wealth creation. The entrepreneur in us sees opportunities everywhere we look, but many people see only problems everywhere they look. The entrepreneur in us is more concerned with discriminating between opportunities than he or she is with failing to see the opportunities.

- **AWARENESS THROUGH TECHNOLOGY**

To promote entrepreneurship among students, a session was conducted at the Institute of Engineering & Management, Kolkata as a part of NEN E-Week 2015 to introduce students to use of technical tools and resources at their disposal to enable them to be successful entrepreneurs, pooling their resource base for problem solving and risk mitigation. It is hoped that the students was greatly benefitted from the insight they will gain.

- **COMPETITION IS A BLESSING IN DISGUISE**

One wonders whether the current trend of cut-throat competition is at all beneficial to young minds. One perspective is that the pressure does not allow people to think as freely as they would have done in less tense situations; while another school of thought believes that competition fosters the spirit of ingenuity, enables students and professionals to scale up their limits. This seminar is an attempt to clarify the finer aspects of how one can use competition to his/her own benefit.



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- **EX-MEN**

To celebrate Saraswati Puja in a grand way, IEM E-cell has organised an alumni meet and talk session on Friday. The alumni members will pay their tribute to the Goddess of Learning along with the students and faculty members. In the talk session titled Ex-Men, successful entrepreneurs from the college are going to share the stories of how they made it big after passing out. It is aimed towards motivating the current students to choose a path of their own, as their seniors have done.

- **SELF-REFLECTION EXERCISE:" DAD SAYS PH.D, MOM SAYS PUBLIC SECTOR. I SAY ENTREPRENEUR"**

It is the subject of discussion in most Indian families which is the cushiest job that the latest graduate from the family should take. E-Week India plans to eliminate the cushy factor from the discussion by holding a self-reflection exercise in which students choose whether they want a comfortable office chair, a career in academics or a path filled with unknowns.

- **LYING IS NOT A BAD HABIT**

How many times in primary school have you been told that lying is a cardinal sin? The tables are going to be turned this time at IEM where the E-Cell has organized an off-track event in which participants discuss how lying can be a profitable habit. Be prepared for some interesting ideas!

- **TWO IS COMPANY, THREE IS CROWD.**

Two is company, three is crowd is a good policy to maintain while starting a venture. Two schools of thought will debate this out in what promises to be a star attraction on day 6 of our E-Week celebrations.



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- **ENTREPRENEURSHIP IS A DISEASE**

"What is the most resilient parasite? A bacteria? A virus? An intestinal worm? An idea.

Resilient, highly contagious. Once an idea has taken hold of the brain it's almost impossible to eradicate. An idea that is fully formed, fully understood. That sticks, right in there somewhere." -
Dom Cobb in Inception

- **MODEL DISPLAY: LED IN EVERYDAY LIFE TO REDUCE POWER CONSUMPTION**

Electrical power has been the single most important resource in demand for the past few decades. However, overuse of electrical power has led to its severe shortage in recent times. One major way to cut down consumption would be to phase out incandescent lamps in favor of LED's, which have a longer life and are more energy-efficient. An innovative model on the above was unveiled by the students of Institute of Engineering & Management, Kolkata about the use of LED's in everyday life.

- **IS ENTREPRENEURSHIP VIABLE IN THIS DAY AND AGE?**

Most students these days after passing out, go for the comfort and security of a job, than venture for the risks of entrepreneurship. To counter this mentality, a talk session will organized at Institute of Engineering & Management, Kolkata about whether entrepreneurship is viable in this day and age or not, as a part of NEN E-Week 2015. Focus was laid on the fact that while entrepreneurship does entail some risks, the returns too are immense.

- **DEBATE: PLASTIC BAG VS HAND-MADE PAPER BAG**

It's an age old question, when it comes time to check out when grocery shopping: paper bag or plastic bag? On 14th February 2015, students of Institute of Engineering and Management will once again attempt to answer the above, as they battle it out in a debate as to whether felling



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trees to make paper bags or using non-biodegradable plastics is more harmful to the environment. Stay tuned for loads of excitement and fun.

- **COLLAGE COMPETITION**

Collage competition was held on Valentine's Day to encourage people to create great art out of scrap paper. It is meant to be a crowd puller event.

- **FUNNOVATION**

"When the Wright Brothers were figuring out how to fly, they weren't saying, 'Wow -- we have this opportunity to build the airline industry,'" said Tim O'Reilly, founder and CEO of O'Reilly media. "They were saying: 'This is amazing! You think we could actually get off the ground and fly like a bird?'" If innovation could be compared to a four-cylinder engine, according to O'Reilly, fun would comprise the first cylinder.

- **RECOGNIZE**

As a part of NEN E-Week 2015, the E-Cell of Institute of Engineering and Management was organizing an audio-visual quiz entitled "Recognize". A picture will shown which shall be comprised of a mashup of faces of several prominent entrepreneurs, and students shall have to identify the same. There shall be an initial prelims round, followed up by finals. Several exciting prizes are to be won - are you up for the game.



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- **FACE PAINTING**

Students of IEM had a morning of complete entertainment as they unleashed the artist within during the Face Painting competition organised by the IEM E-Cell. Vibrant colours and confident brush strokes were on display during the one hour in which students painted their classmates' faces with varied designs, shades and ideas. The professors and organisers were stunned to see the artistic abilities exhibited by the students and were in awe at such wonderful skill.

- **STUDY OF ORGANISED AND UNORGANISED RETAIL SECTOR**

The study will indicate how the consumer was benefited from organized retailers. The survey intends to analyze the consumer behavior towards organized and unorganized retailing, their source of purchasing and the factors which influences their mall purchasing in India.

- **GROUP DISCUSSION: ALTERNATIVE ENERGY USES**

The energy crisis faced by the world in recent times is largely due to the use of non-renewable sources of energy. Added to that is the problem of pollution. As a part of our awareness campaign, a group discussion on alternative energy uses was conducted at Institute of Engineering & Management, Kolkata as a part of NEN E-Week. The importance of alternative sources of energy for sustainable development was highlighted.

- **STUDENT VENTURE WORKSHOP**

A workshop on “Student Ventures in Colleges” shall be conducted in Institute of Engineering & Management, Kolkata on 13th February 2015, during NEN E-Week. Among the speakers present was B Hari, founder of Ontrack Systems Ltd. and Arijit Bhattacharya, founder and CEO



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at virtualinfocom. Students shall be given an insight into how their ideas and innovations can be implemented as profitable ventures, and the basic hurdles faced by a start-up shall also be discussed in details. It is hoped that students shall gain an insight into entrepreneurship through this.

- **HAND PAINTING AND FACE PAINTING**

The students of Institute of Engineering and Management, Kolkata will show that innovation, quite literally, is in their hands, as they organize a hand painting event to promote NEN E-Week 2015. Messages promoting entrepreneurship shall be hand-painted and put up in and around the college campus. In addition to hand painting, face painting shall also be included in the event.

- **SPEECH ON ROLE OF SOCIAL MEDIA FOR STARTUPS IN INDIA**

Promoting a startup can seem like a daunting task, especially if you don't know where to start. Entrepreneurs need to get the word out about their business to potential investors, employees and, most importantly, customers. In this regard, Aji Issac Matthew, the CEO and co-founder of TechShu.com, will reach out to the students of Institute of Engineering and Management about how entrepreneurs can leverage data from social media to advance their initiatives.

- **STUDENT ACTIVITIES: CANTEEN - SALE OF FOOD TO GENERATE REVENUE**

In order to promote the spirit of entrepreneurship, a debut venture was carried out by students of Institute of Engineering & Management on the college premises itself. A student-run canteen was inaugurated and funding, resources and sale were all handled and streamlined by the students themselves. Managing an actual enterprise, albeit on a small scale, was surely a learning experience for us budding entrepreneurs!



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- **SLOGAN COMPETITION**

Slogans- But not any political ones. It is totally related to sports & different sporting personalities. We shall make slogans to define different sports & way of enjoying the sports. These slogans which can be used by the crowd of that sports to cheer their team or player.

- **WORKSHOP: INNOVATIVE WAYS TO RECYCLE E-WASTES**

E-Wastes, or electronic wastes, are continuing to pile up day by day as our dependence on electronic devices in our daily lives grows more and more. In order to deal with the growing menace, a workshop on innovative ways to recycle e-wastes was organized by the Institute of Engineering & Management as a part of NEN E-Week. Various methods to reduce, reuse and recycle e-wastes and hence cutting down on their volume were also discussed.

- **POSTER SHOWCASE**

A Poster Competition. Theme- Innovation of any kind on any topic showcasing the best ideas of ours in small & colorful way.

- **140 CHARACTERS CHALLENGE**

In this age of social media, we the students of Institute of Engineering and Management, in a bid to spread word about NEN E-Week, have introduced an innovative message campaign entitled "140 Characters Challenged", where a message about the event will have to be posted to social networks within a limit of 140 characters. The theme for the event is "I was born to be my own boss."

- **LAUNCH OF AN INNOVATIVE MODEL NAMED "STALKER"**

If you are a fan of the pug we see in a certain cellphone commercial so often on TV, who supposedly follows you wherever you went - fret not, students of Institute of Engineering and



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Management bring forth to you the "Stalker" - a robot, which uses motion tracking systems to follow a person wherever he or she goes. The bot can be programmed to assist us in several day-to-day tasks, thus finding for itself an useful application.

- **LAUNCH OF A MODEL ON EFFICIENT POWER TRANSFER**

One of the main problems faced in power transmission is the power losses which are involved in the transfer, which lead to wastage of energy. Keeping that in mind, the students of Institute of Engineering and Management, Kolkata have developed a model on efficient power transfer, which tries to significantly cut down transmission losses. This would help conserve energy in the long run.

- **MODEL DISPLAY: AUTOMATIC ROOFTOP SYSTEM**

Imagine a house, that automatically swivels away the roof when there is sunshine, and brings the shelter right back in times of adverse weather, such as rain. Well, with the advent of the "Automated Rooftop System". brought to you courtesy of students of Institute of Engineering and Management, such a thing might not be far from being implemented in real-life. This innovative project is being implemented during the NEN E-Week 2015.

- **MODEL DISPLAY: SPYBOT**

A miniscule robot, moving in silently, monitoring and watching for activities - sounds like straight out from the sci-fi thrillers, doesn't it? Well, not for the students of Institute of Engineering and Management, who will introduce a "Spybot" - an innovative venture during NEN E-Week 2015. The spybot is aimed primarily for applications in the field of security, such as monitoring and checking. Be sure to check out this cool gizmo!



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- **CORPORATE SOCIAL RESPONSIBILITY**

IEM hit the roads of Kolkata to do our project on Three Different fields

- 1) Anti-Smoking
- 2) Traffic/Transport System
- 3) Wastage & Economic inequilibrium

We will divide ourselves in groups of 8 to 10 members with each group doing a survey on anyone one of this topic to find out what we can do to help our society at least in this three areas.

Prizes are there for the 1st two best projects.

- **SCREENING FILMS ON ENTREPRENEURSHIP**

Movies are a great way to learn from others as stories, fiction and nonfiction, are taught to the viewer in an easy to understand way. There's a lot to be learnt from these stories as they show you how exceptional people who have come before you have done it.

- **GOING GLOBAL**

Every entrepreneur dreams of taking his ideas to the global audience, but not everyone is a Henry Ford or a Bill Gates. That is why IEM E-Cell has organised "Going Global" - an entrepreneur talk session on how to make it big on the world stage.

- **SEMINAR "WHY INVEST IN INDIA?"**

An interactive seminar is scheduled to be held where Prof. Ray will discuss the pros and cons of entrepreneurship and investments in India. The discussion was thrown open to the audience where the most important question should ideally be answered "Will YOU invest in India?"



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- **ARTICLE COMPETITION**

An event with a literary bent to it, the article competition organised by IEM E-Cell is an event where the students of both engineering and management streams can put on their thinking caps and suggest innovative solutions to particular problems prevalent in our society - educational, environmental, economical, etc. It plans to be a novel approach at finding permanent solutions to our temporary problems. Prizes are on offer for the best written article as well as the best solution to a contemporary problem

- **STORY OF AN ENTREPRENEUR - BACK TO THE ROOTS**

At our entrepreneurs talk session on Sunday, we had invited Arun Pandit, Area Manager, Marketing & Customer Service Territory Leader at RPG Enterprises to share his experiences about taking our ideas beyond the drawing board. He shared with the students their stories about how they made it large among the who's who of the corporate world. Motivational videos were shown to the students. (Links shared below).

- **DISCUSSION ON "MBA EDUCATION MAY BE A WASTE OF MONEY."**

They say that, not everything can be learnt within a classroom. The skill of management is essential for any level of entrepreneurship. But given the high cost of attaining an MBA degree for the general masses, is it always worth the expense? Or do you think it may be a waste of money? A topic of panel discussion which has multiple angles of approach and a lot of hidden spice!



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- **IDEA GENERATION WORKSHOP**

As a part of NEN E-Week 2015, the E-Cell of Institute of Engineering and Management would organize a workshop which would open up young scientific minds to come up with ideas from old newspaper editions of a certain period of the technological history. The ideas would later be evaluated and would be encouraged into the formation of real existing models.

- **TALK BY STUDENT ENTERPRISE**

IEM ecell organised the event of showing and explaining the content of a topic to the audience. A variety of presentations with amazing slides was displayed. Young students was able to convey their topic. There was a collection of innovative topics which was followed by healthy discussions.

- **DEBATE ON "IS FORMAL DIPLOMA OR DEGREE REQUIRED TO BE A SUCCESSFUL ENTREPRENEUR"**

The NEN E-Week 2015 would feature a battle of words amongst orators as they hammer on the audience their opinions on whether a formal degree is really required to prove the excellence of one at succeeding at entrepreneurship. What do you think?

- **RADIATE**

As a part of NEN E-Week 2015, the E-Cell of Institute of Engineering and Management will organize an Entrepreneurs Talk on how to sustain and expand growing business. The students was briefed about the four principles for being a successful entrepreneur-"Create a masterpiece daily, Be a joy carrier to those you serve, Assume complete accountability for results and Be both a doer and marketer".



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- **MEDIA CENTRE AND PANEL DISCUSSION**

Smart businesses know that social media is a power to be reckoned with, as it creates a direct line of communication between the company and consumers and allows anyone with an internet connection instant access to the latest buzz around your products or services.

- **WHERE DO YOU SEE YOURSELF IN 5 YEARS?**

Where do you see yourself in 5 years? Most business owners have an idea where they want to be in 3-5 years. If not, this is even more important for you. The key to this process isn't so that your 3-5 year plan is set in stone. In reality the middle is gone when it comes to planning. Most of us can only plan for certain for the next 90 days. Looking ahead to where we want to be in the next 3-5 years forces us to come to grips with our reality and recognize the gap that exists between where we are now and where we want to be.

- **RIDING THE WAVE**

Entrepreneurs who make it beyond their first few “lean and mean” years learn to let the rewards of freedom trump the anxiety of “what if I fail?” They acquire a devotion to the rhythm of riding their vision, unshackled from the slavery of following a conventional schedule. The event "riding the wave" was organised by IEM E-Cell to throw some light on how an entrepreneur has to face numerous challenges.

- **GIBBERMONIUM**

Several young wannabe entrepreneurs were given a platform to share their views on some of the critical issues related to successful entrepreneurship. There were debates and some thought provoking point of views. All in all it was undoubtedly a great event and had an amazing effect on all the contestants as well as the listeners. Everybody learned some or the other thing from the healthy debate.



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- **ENTREPRENEUR OF THE DAY**

Focus, management, learning ability, resilience are some of the essential qualities an entrepreneur needs. Here at Institute of Engineering and Management, Kolkata, we announced the entrepreneur of the day based on his overall performance. We wrapped up the day with this announcement. We hope it was both an enjoyable and learning experience for the students!

- **RS.100 CHALLENGE**

One of the most exciting and out of the box event was "Rs.100 Challenge ".This was the most trending event of the day. The event was all about converting a 50 rupee note to a 100 rupee note. We witnessed a lot of innovative ways of converting the above mentioned task. There was also a fun factor involved as some of the participants went out of their way to find new and innovative ways. Overall it was a unique kind of an event and drew a large chunk of crowd.

- **MANAGEMENT GAMES (BALL AND BASKET)**

Along with events IEM e-cell also organised for gaming events where participants participated in a group. The main motive of the event was to make participants work in a group and do task with each-others help and support as group work is the main key of success. Many group participated it to make it a success and resulting a positive feedback from every participating group.

- **WHO WANTS TO BE AN ENTREPRENEUR?**

Young entrepreneurs, college students and parents gained a better understanding of the critical steps involved in starting a business during this event organised by IEM as part of the NEN E-week.



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- **ENTREPRENEURS TALK - MY STORY**

The second event as part of NEN E-Week 2015 was very inspiring for all the participants. Many among us want to become successful entrepreneur but we lack the motivation to overcome the situation we are currently in. So session came up with several examples of people who overcame hardships and became successful. Such people had the vision and they had staunch belief upon themselves. They came up with many ideas and they have set up a benchmark for our students to equal and excel.

- **ETHICS IN ENTREPRENEURSHIP**

Over recent years there's something of a groundswell of interest in the concept of 'ethical/social enterprise' – the agendas around corporate social responsibility; the growth of the fair trade movement; government policy in respect of social enterprise and legislation concerning environmental impact to name but a few.

- **GROUP DISCUSSION ON "ALTERNATIVE ENERGY USES"**

IEM e-cell during the NEN e-week organised a group discussion on how we can use different sources of energy which are readily available and does not cause harm to environment this .this is one of the developing sectors as big organization along with the government are focusing on it, they are ready to help financially just waiting for productive ideas keeping this aspect in mind we organised a group discussion in exchange ideas on how we can bring up new ideas.

- **GROUP DISCUSSION ON "FINANCIAL VIABILITY OF SOCIAL ENTREPRENEURSHIP"**

As a part of NEN E-Week 2015, the students were given the chance to reflect their ideas on social entrepreneurship. One of the most important setback for the industry today is how they can directly help in the upliftment of the society as a whole. The participants came up with many



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innovative ideas. The organizations have to more responsible about the environment issues and the tribal people. Keeping these issues helps one to be responsible entrepreneur.

- **SOCIAL ENTREPRENEURSHIP PROJECT PROPOSALS**

To prove their worth in business strategies, young and enthusiastic students submitted various innovative entrepreneurship projects. This event was called "Social Entrepreneurship Project proposals". The event had lots of participants with excellent ideas. The event was about exercise on business setup. Interesting projects with an adequate economical approach were found. The event drew large number of people and was found to be a success with huge number of participants and their new and innovating projects.

- **AD - O - WIT (PREPARATION OF ADS OF VIRTUAL PRODUCTS)**

One of the most brainstorming event of the day was preparation of virtual ads whereby the students were given imaginary situations to prepare ads of virtual products. Ads comprise a very important tactic of the companies to attract customers to buy their product. So the companies try to create innovative ads. The students displayed their creativity and prepared interesting, informative ads. The ads were very convincing given that were aired and students being given the opportunity.

- **LAUNCH OF BACK OF THE ENVELOPE EXERCISE**

As a part of NEN E-Week 2015, the E-Cell of Institute of Engineering and Management launched the back of envelope. The envelope was designed by a team virtually. Then it was printed on a colorful paper having the logo of our college. The college's address was printed on it so that it would decrease the workload while sending them. It was very interesting exercise and several groups came up with many innovative designs. Finally, an envelope was selected from among them.



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- **STAIRWAY TO HEAVEN AND PANEL DISCUSSION**

Entrepreneurs dream of building a big business from scratch, but is that really what it means to succeed? Is there more to startup success? In this entrepreneurs talk organized by IEM as part of NEN E-Week, students discovered simple tools to identify a holistic definition of success that not only measures the financial rewards of startup success, but also creates success metrics for personal, social, environmental value.

- **MOVIE SCREENING - GOOGLE ENTREPRENEURS**

IEM e-cell during the NEN e-week organized a competitive event where all the participants were shown an adverse situation and were told to come up with its solution .the winners of the event were also awarded with prizes .this event created a competitive environment in the campus. The main motive of the event was to make participant think about solution to resolve the crucial events which may emerge in any phase of life.

- **TALK ON OPPORTUNITIES IN EDUCATION**

As a part of NEN E-Week 2015, the E-Cell of Institute of Engineering and Management organized an Entrepreneurs Talk on opportunities in education. There was a debate on some critical issues related to successful entrepreneurship. Becoming a successful entrepreneur is all about problem solving.

- **RECOGNIZE: PRELIMS**

One of the most captivating events of the day was the quiz. The event was about an exercise on identifying the famous entrepreneurs. Several students participated in groups with all their enthusiasm. The groups were asked questions about them and clues were given. Participants had to guess the personalities based on the clues given and were awarded points. The groups



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emerging top three were awarded. The energy and the response of the participants was tremendous.

- **PANEL DISCUSSION: OFF THE BEATEN TRACK**

The students of IEM discovered the importance of ethics in entrepreneurship during the NEN E-Week. "Ethical Entrepreneurship", a guide to surviving the next economic crisis. Simple? Sure. But not easy. Like true wisdom, success is a lifetime commitment. Why ethical? Simple. Ethical works. And not just for the short-term but for the long term.

- **DEBATE ON "CAN INNOVATION BE TAUGHT IN ACADEMIC INSTITUTE"**

As a part of NEN E-Week 2015, the E-Cell of Institute of Engineering and Management organized a debate on "Can innovation be taught in Academic institute. "Innovation is the application of better solutions that meet new requirements, unarticulated needs, or existing market needs. Due to its widespread effect, innovation is an important topic in the study of economics, business, entrepreneurship, design, technology, sociology, and engineering.

- **GOOD OL' DAYS** As a part of NEN E-Week 2015, the E-Cell of Institute of Engineering and Management organized an Entrepreneurs Talk event. The panelists discussed their paths to entrepreneurial success, and offered advice and recommendations to the students about the importance of sound personal and professional finance.

- **PRESENTATION OF INNOVATIVE BUSINESS IDEAS BY STUDENTS WATER ENERGY GENERATION**

As part of NEN E-Week 2015, the E-Cell of Institute of Engineering and Management organized a presentation of innovative business ideas by students water energy generation.



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- **TALK BY STUDENT ENTERPRISE**

One-to-one business surgeries, which enabled student entrepreneurs to get free in-depth advice from those in the know. A host of companies came in to talk to on topics such as marketing, branding, accountancy, legal and pitching. This space has enabled students to share experiences and is encouraging a fantastic entrepreneurial culture!

- **THE ENTREPRENEUR WITHIN & PANEL DISCUSSION**

IEM E-Cell decided to unveil and highlight entrepreneurial talents within its own institution in the NEN E-Week. Every year we hope to showcase some of the most innovative students that are putting their creative energies to use.

- **OPPORTUNITY EVALUATION WORKSHOP**

Along with other events IEM e-cell also organised a workshop where participants' were made to analyse a business idea based on the ideas based on the Seven Domain Model .this was among the productive events where participants were made to think over the models based on seven domain model shown to them. This was a very interactive session which gathered a huge crowd.

- **WORKSHOP ON MANUAL ROBOTICS**

A workshop on Manual Robotics was held as part of NEN E-Week by IEM. Manual is the ideal way to spice up theoretical concepts in electronics with the dynamicity of robotics through a workshop focused on the art of building autonomous robots out of discrete electronic components. Students applied concepts learnt in classrooms in new and interesting ways creating simple yet seemingly complex task performing robotic creatures. The workshop inculcated numerous hands-on sessions on designing, analyzing and building circuits.



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- **ENTREPRENEUR OF THE DAY**

Focus, management, learning ability, resilience are some of the essential qualities an entrepreneur needs. Here at Institute of Engineering & Management, Kolkata, we announced the entrepreneur of the day based on his overall performance. We wrapped up the day with this announcement. We hope it was both an enjoyable and learning experience for the students!

- **GROUP DISCUSSION:PROVIDING TESTING SOLUTIONS FOR INDUSTRY**

A group discussion was held in the Engineering Campus of Institute of Engineering & Management, Kolkata based on testing solutions for industrial problems.

- **JUMP-START**

The starting of new business by young entrepreneurs lack access to banking and related services due to the high transaction costs associated with serving client categories. As young entrepreneurs step out to set up their own enterprises, it helps if one has the backing of a microfinance and marketing establishment.

- **FUSION**

Institute of Engineering & Management, Kolkata organized this event to expose young entrepreneurs to the world of merger and acquisition-market shares, buying and selling of companies and other related processes. At a matured stage of any business venture, these processes are inevitable for achieving success. So giving the budding entrepreneurs an idea of these, E-cell helped them chalk out their future plans. The event was quite an important one and Mr. Indraneel Mukherjee made the entire session quite interactive and lively.



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- **STUDENT ACTIVITIES - CANTEEN- SALE OF FOOD TO GENERATE REVENUE**

In order to promote the spirit of entrepreneurship, a debut venture was carried out by students of Institute of Engineering & Management on the college premises itself. A student-run canteen was inaugurated and funded, resources and sale were all handled and streamlined by the students themselves. Managing an actual enterprise, albeit on a small scale, was surely a learning experience for the budding entrepreneurs!

- **FINALS OF BUSINESS QUIZ**

The finalists of the amazing B-Quiz competed against each other in the final round of the event. Each round of the event proved to be more interesting and attracted a huge crowd. Audience were also given chances to make attempts to some really challenging questions and attractive gifts were also given to the audience. The finalists had a tough fight making the event all the more exciting. The winners and first and second runners-ups got exciting prizes at the end.

- **GROUP DISCUSSION "MORE ENTREPRENEURS REQUIRED FOR THE DEVELOPMENT OF WEST BENGAL"**

A group discussion was organized by the Institute of Engineering & Management as a part of the NEN E-week where students discussed about the requirement of entrepreneurs in West Bengal.

- **WORKSHOP ON "INNOVATIVE WAYS TO RECYCLE E-WASTES"**

E-Wastes, or electronic wastes, are continuing to pile up day by day as our dependence on electronic devices in our daily lives grows more and more. In order to deal with the growing menace, a workshop on innovative wastes to recycle e-wastes was organized by Institute of



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Engineering & Management as a part of NEN E-Week. Various methods to reduce, reuse and recycle e-wastes and hence cutting down on their volume were also discussed.

- **BOOK DONATION CAMPAIGN**

We organized a book donation drive that did particularly well. With thousands of books already at our disposal, we are indeed overwhelmed by the response. What is even more endearing is the fact that people themselves want to change and contribute. And all of it was achieved by changing the perception of people; books that were completely useless to them will now serve as most useful to many.

- **SELF REFLECTION EXERCISE "WHAT HAVE I LEARNT TODAY?"**

The creative writing competition organised by IEM E-Cell is an event where the students and participants of both engineering and management streams wrote about what they had learnt through the events of the day. Prizes are on offer for the best written article.

awareness of the potential and of the opportunity that exists, for investors, entrepreneurs and engineers is an important milestone. Thus, IEM E-Cell organised a discussion on the use of technology to spread awareness which was followed by a panel discussion.

- **PANEL DISCUSSION: STOCK OVERFLOW**

A panel discussion was held at the Institute of Engineering and Management, Kolkata on the speaker event "Stock Overflow" held earlier. The panel discussion was conducted by Mr. Kushal Banerjee where the students discussed about the present market scenario, money holding ,profitable investments. Various aspects of entrepreneurship were also discussed, and questions from the students were also clarified. We hope it was both an enjoyable and learning experience for the students.



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CHAPTER-3

PROJECT PROGRESS REPORTS



IEM IEDC 2015 PROJECT, TEAM DETAILS

SI No.	Entrepreneurs Startup	Product/Service	Directors
1	WiPr	Wireless Printing devise. (Product)	Subhodip Kumar
2	Renderbit	Bluetooth Aided switchless Home (Product)	Sushmit Bhattacharya Shashwata Gupta
3	Distronix	Automatic Foul-Detection Shin pad for Football (Product)	Rohit Sarkar Shoumik Ghosal Somjit Bhowmick
4	Quasar Power	Home Security System (Product)	Saptarshi Hazra Soumayan Dutta
5	I-RoBin	Reading System for the Blind (Product)	Binayak Ghosh Roshwin Sengupta Ishita Banerjee



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CHAPTER-3.1

PROJECT PROGRESS REPORT

OF

WIRELESS PRINT



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IEDC Project Report

Of

**Wipr-A system to give wireless printing capabilities to the
existing printers**

Prepared by: Subhodip Kumar, B.Tech (IT) Fourth Year





1. Abstract (Overview of the Idea):

My Project aims to build a Low Cost, Portable, Plug-n-Play device, which will convert any current USB or Parallel port based Printer e.g. [1] into a wireless printer (e.g. [2]). Using the device anyone would be able to submit print jobs wirelessly to their existing printers via Wi-Fi from their Mobile Phones, Tablet Computers or PCs. In the current scenario printing from Mobile phones and tablets is a major pain point for users, as Conventional printers cannot take print jobs from these devices and it requires user to either replace their existing printers with a costly Wi-Fi enabled printers or transfer the print job to a PC first before getting them printed.

2. Current Problem (Why we need such a device)

- 1) Legacy printers need to be connected to a computer (via usb or parallel port) in order to get a printout of the required documents, but some modern printers have wireless printing capabilities so that anyone can submit print jobs wirelessly via their PCs or mobile devices . But the existing printers and large no of printers currently in market do not have this wireless printing capability.
- 2) Printing from mobile devices like a mobile phone or a tablet computer or a digital camera is largely restricted or not possible without a personal computer.

3. Task/Objective (what I planned to do):

The objective was to build a device that lets users print wirelessly from any Device i.e. Desktop/MAC/iPod/iPhone/iPad/Android Phone/Windows Phone etc.

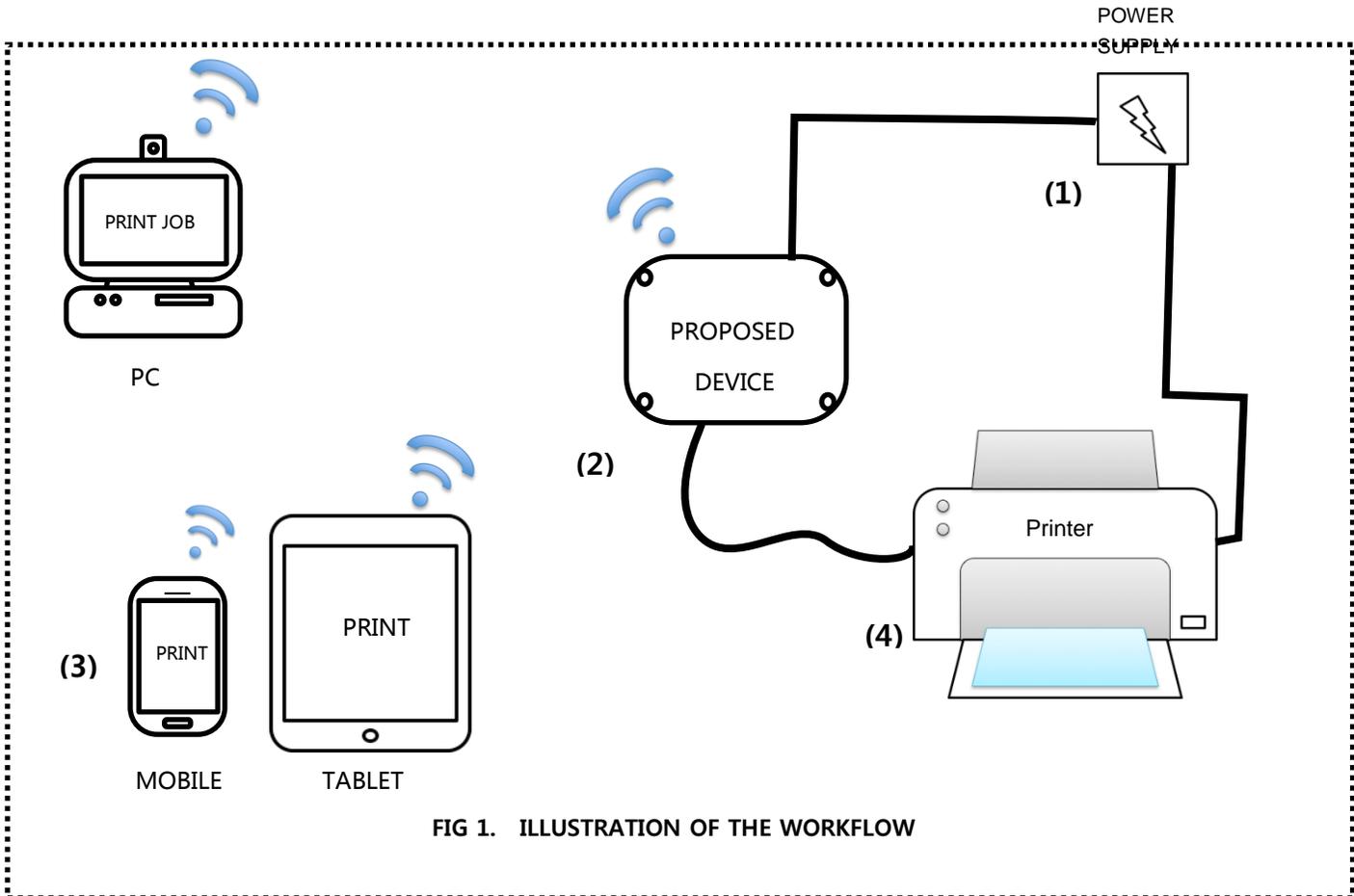


FIG 1. ILLUSTRATION OF THE WORKFLOW



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The device needs to have the following features:

- Plug-n-Play operation: user just needs to connect the printer to Wipr and submit print jobs from any Wi-Fi device on the same Wi-Fi network straight away, no configuration must be required.
- User should be able to administer the Printer via a User-friendly simple user interface.
- Platform independent Service. Print jobs can be sent from any devices/platform iOS/Android/Windows/MAC
- User should set up Authentication for sharing of printers. i.e. user can setup username/password for sending print jobs to the printer.
- The device should be low cost and of Low Power Consumption.

4. Progress so far (on an application level)

The Early Prototype has following features:

1. Plug-n-Play Operation – User needs to switch on the device and the print jobs can be submitted right away.
2. Print Jobs can be submitted from all leading platforms-
 - iOS (tested on iOS 7.0 onwards)
 - OSX (tested on OSX 10.5 onwards)



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- Android (tested on Jellybean onwards)
 - Windows (tested on windows 7 onwards)
3. User can administer printers from a admin interface,
 4. The Prototype has been based on Raspberry Pi, which consumes very low power and is portable.
 5. Wipr has 100% printing Success rate.

5. Solution (How I did It)

Step 1: Selection of the Development Board

In the First Phase the plan was to build a proof-of-concept design. The idea was to use a single board computer to act as a receptor of Print jobs via Wi-Fi and transfer them to the printer for spooling. I used Raspberry Pi for the purpose as it's dependable, has a respectable user base which might be used in case an error occurs and help is needed from the community and it was the cheapest single board computer available in market with enough processing power that serves the purpose.



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The specifications of the Raspberry Pi used [3]:

- **Chip:** Broadcom BCM2835 SoC
- **Core:** architecture ARM11
- **CPU:** 700 MHz Low Power ARM1176JZFS Applications Processor
- **GPU:** Dual Core VideoCore IV® Multimedia Co-Processor
 - Provides Open GL ES 2.0, hardware-accelerated OpenVG, and
 - 1080p30 H.264 high-profile decode
 - Capable of 1Gpixel/s, 1.5Gtexel/s or 24GFLOPs with texture filtering and DMA infrastructure.
- **Memory:** 512MB SDRAM
- **Operating System:** Boots from Micro SD card, running a version of the Linux operating system Dimensions: 85 x 56 x 17mm
- **Power:** Micro USB socket 5V, 2A



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I primarily used Raspbian OS[4] to run on the Raspberry Pi which was the most stable one to be found.

Step 2: Getting Wi-Fi on board:

The next step was to setup Wi-Fi in the board. Raspberry Pi doesn't come with pre-implemented Wi-Fi on the board, so the idea was to use a low cost Wi-Fi dongle to make the prototype. I used the cheapest available one from the market.

The specifications of the Wi-Fi Dongle used:

Name : Leoxsys LEO-NANO150N

Standards : IEEE 802.11b
 IEEE 802.11g
 IEEE 802.11n

Interface : USB2.0 Type A

Frequency Band : 2.4000 ~ 2.4835 GHz

Data Rate : IEEE 802.11b: 1/2/5.5/11 Mbps
 IEEE 802.11g: 6/9/12/24/36/48/54 Mbps



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- IEEE 802.11n (20MHz): MCS0 - 7 (upto 72Mbps)
- IEEE 802.11n (40MHz): MCS0 - 7 (upto 150Mbps)

Security : WEP 64/128

WPA

WPA2

WPS

Antenna : Internal Antenna (1T1R)

Output Power : IEEE 802.11b: 17+/- 1.5dBm

IEEE 802.11g: 14+/- 1.5dBm

IEEE 802.11n: 14+/- 1.5dBm

Supported OS : Windows 2000/XP/Vista and Windows7

LED : Link/Activity

Dimension : 27(L) x 15(W) x 7(H) mm (with front cover)



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- Temperature** : Operating: 0 ~ 40 Degree Celsius
 Storage: -20 ~ 60 Degree Celsius
- Humidity** : Operating: 10 ~ 90% (Non Condensing)
 Storage: Max. 95% (Non Condensing)
- Certifications** : CE, FCC

The next problem was Leoxsys LEO-NANO150N doesn't support Linux at first place so the driver was to be compiled from the source and installed from the command line, based on the Wi-Fi chipset the adaptor uses- A REALTEK 8188ETV chipset.

Step 3: Getting the board to auto connect to Wi-Fi

The solution was to get the RPi a static IP and changing the network configuration file to connect to a auto connect to a wifi network with a specified name.

The following are the changed interfaces and configuration files that solved the problem.

```
# /etc/network/interfaces
```

```
auto wlan0
```



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```
iface lo inet loopback

iface eth0 inet dhcp

allow-hotplug wlan0

iface wlan0 inet static
address 192.168.43.158

netmask 255.255.255.0

gateway 192.168.1.1

wpa-conf /etc/wpa_supplicant/wpa_supplicant.conf

iface default inet dhcp
```

```
# /etc/wpa_supplicant/wpa_supplicant.conf

ctrl_interface=DIR=/var/run/wpa_supplicant GROUP=netdev
update_config=1

network={
ssid="wipr"
psk="wipr"
proto=RSN
key_mgmt=WPA-PSK
pairwise=CCMP
auth_alg=OPEN
}
```

So, now the Board connects to any wifi network named “wipr” automatically without user intervention. Highly required to make the end product device a plug-n-play one. Also the RPi



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now has a static IP address 192.168.43.158 so any Tablet, Computer or Mobile phone on the same wifi network named “wipr” can communicate with the board via wifi.

Step 4: Bypass the Login mechanism in Raspbian OS:

I wanted the prototype to be display free, 0 setup and a plug-n-play device, but currently the RPi needs a username and password to be entered before the functionalities of the OS can be used.

The following process solved the problem:

In Terminal:

```
sudo nano /etc/inittab
```

Scroll down to:

```
1:2345:respawn:/sbin/getty 115200 tty1
```

and change to

```
#1:2345:respawn:/sbin/getty 115200 tty1
```

Under that line add:

```
1:2345:respawn:/bin/login -f pi tty1 </dev/tty1 >/dev/tty1 2>&1
```

Ctrl+X to exit, Y to save followed by enter twice

Now once the RPi is switched on it automatically connects to the wifi network and that too without connecting it to display and keyboard.

Step 5: tweaking common Unix printing system for zero configuration plug-n-play experience.



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Common Unix Printing system was made by Apple Inc. for its mac operating system to handle print services on its OS. It has some wonderful features that we might use for our project as it aligns with our goal, is open source, is extremely lightweight.

CUPS consists of a print spooler and scheduler, a filter system that converts the print data to a format that the printer will understand, and a backend system that sends this data to the print device. CUPS uses the Internet Printing Protocol (IPP) as the basis for managing print jobs and queues. It also provides the traditional command line interfaces for the System V and Berkeley print systems, and provides support for the Berkeley print system's Line Printer Daemon protocol and limited support for the server message block (SMB) protocol. System administrators can configure the device drivers which CUPS supplies by editing text files in Adobe's PostScript Printer Description (PPD) format. There are a number of user interfaces for different platforms that can configure CUPS, and it has a built-in web-based interface. CUPS is free software, provided under the GNU General Public License and GNU Lesser General Public License, Version 2.

CUPS takes care of:

- Printer Detection.
- Printer Management
- Setting up a web server for accessing the admin panel.

But the problems with CUPS, which hampers the user experience and zero configuration operation that we want are:

- Complicated Admin interface for management of printers- not suitable for Novice users.



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- Adding Printers is a troublesome task, as one has to select the printer driver from a list of printers available manually.

So after installing CUPS the admin interface can be accessed by anyone via the ip address of the RPi i.e `http://192.168.43.158:8080`

Now we need the devices to automatically detect the printer in the local network. For the purpose we can use mDNS or DNS-SD to broadcast device addresses in the local area network so that the devices can detect and send print jobs directly to the RPi.

So, we install Avahi-Daemon, which runs the mDNS and DNS-SD service at the background to broadcast Wipr's address to the local devices. Now Apple's AirPrint Technology is based on Bonjour, which locates devices such as printers, other computers, and the services that those devices offer on a local network using multicast Domain Name System (mDNS) service records. The software comes built-in with Apple's OS X and iOS operating systems.

But the problem is we need to set up the AirPrint announcement via the Avahi Daemon. So we need a script which will connect to a CUPS server and for each printer configured and marked as shared will generate a.service file for avahi that is compatible with Apple's AirPrint announcements. Any printer that can be configured to work with CUPS can be used. Printers should not be configured in CUPS as raw, unless the printer can natively print PDF. That is to say, CUPS needs to already be configured with a PDF filter. Debian based distributions such as Raspbian we are working on ship CUPS pre-configured this way.

Now we can submit print jobs from any iOS/OSX/Windows device natively.



6. The Improvements possible:

1. Currently Wipr connects to a Wireless network of a particular predefined name, it must connect to any open wifi network found.
2. Make the Admin User Panel Responsive and more User friendly
3. Add Bluetooth support to WiPr.
4. Create a Custom OS based on Linux Kernel which will have necessary programs, drivers and configuration pre-installed so that any user can install it on raspberry Pi and use it straight away to print wirelessly
5. Custom PCB design with on-board Wi-Fi and Bluetooth based on ARM11 to bring down the cost of package.



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CHAPTER-3.2

PROJECT PROGRESS REPORT

OF

READING SYSTEM FOR THE BLIND



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IEDC Project Report

Of

Reading System for the Blind

**Prepared By: Binayak Ghosh, Roshwin Sengupta, Ishita Banerjee, B.Tech
(ECE) Fourth Year**





1. Abstract (Overview of the Idea):

This project was conceived keeping in mind the day to day struggles faced by the blind and visually impaired people. The main objective of this device is to enhance the overall quality of life for the blind, by providing them greater independence in their daily activities, like reading from blackboards, signboards, grocery shopping, reading bus-numbers from the distance, etc. In this paper, we focus on the objectives and the architecture of our device, along with means for further improvement and ongoing research for this project.

According to a recent survey by a national organization for ophthalmologists^[1], it has been found that India accounts for 20% of the total blind population of the world, with 7.8 million visually impaired out of the 39 million across the globe. Many have a visual impairment with difficulty in reading or are unable to read letters in regular print, even while wearing ordinary glasses. Basic activities such as riding the bus or buying a can of soup at the grocery store are just some of the challenges that these blind people face every day. Furthermore, as the population ages, the number of older individuals who are blind or have low vision will likely increase. Generally, a significant number of individuals who are legally blind find large print or audio texts helpful, while only 8-10% use Braille as a reading medium. On a global scale, there are 39 million blind people; every second, a person becomes blind, every minute, a child becomes blind.

The scope of the initial prototype of our device was to assist the visually impaired with the task of reading text from a distance, like distant signboards, blackboards and also to read text from pages or books nearby. Our prototype design consists of a head mounted, high-resolution camera which can capture the text from a certain distance, an in-built processor capable of converting the detected text into braille code, and a Braille Glove to notify the user of the read text. For the braille glove, a circuit consisting of six vibrator motors attached to the finger-tips and the palm of the glove has been considered.



2. Overview of Existing Reading Devices for the Blind

Many reading devices for visually-impaired people are already available and quite popular too. These devices make use of a scanner which scans the entire document and subsequently the in-built optical recognition system extracts the text from the page. Of these devices, Top-braille is a front-runner, followed by Eye-Pal, Zoom-Ex, etc. But the main limitations of these devices is that they are capable of only reading text from nearby objects like a page of a book or magazine. The Trinetra and Drishti are some of the other cost –effective assistive technology to aid in navigation for the blind. Our device aims at reading text from natural scene images like billboards or hoardings and intimate the user of the detected text with the help of Braille.

3. Objectives and Design Consideration

The technical objective of this device, in the context of reading from distance, is to allow a cost-effective, independent reading experience for the blind. The visually-impaired user should not have to ask for assistance from any other person, and should be able to decipher text from distance as well as nearby spots.

One of our main aims was to ensure that resulting solution was cost-effective on the part of the user. The afore-mentioned existing devices may serve the purpose quite effectively, but they are not affordable by blind users in India. For this purpose, we aimed to use commercial off-the-shelf (COTS) components that were not necessarily developed with blind or visually-impaired people in mind. If we used as many COTS products as possible, our resulting solution was likely to be more cost-effective and widely affordable.

To this end, we used a normal high resolution webcam, a standard headset and one latex glove which has been customised to serve our purposes. The processor is a standard ARM processor^[7] with an in-built video processing module and on the software side we developed an algorithm to pre-process and decipher the extracted text using an Optical Character Recognition program.



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Another off-the-shelf software component was the text-to-speech software that was used to convert the detected text into speech output and relay the information to the user via the headset.

We wanted to ensure that the user interface of our device employed a format that is quite common or intuitive to the user, that the resulting technology was portable, that it could be used without attracting undue attention to the user (e.g. avoiding noises or awkward, bulky gadgets.) The use of the head-mounted camera ensured that the user was quite comfortable, and also the whole processor could be attached to his belt, helping in his mobility. Portability is also a factor we considered, and the whole contraption including the camera and glove can easily be worn by the user during walking, due to very less weight, and do not require any wires because all communication was done through a Zigbee wireless module. By providing our user with a Bluetooth headset, we conveyed the detected text unobtrusively, and directly into the user's ear.

4. Text Detection and Extraction from distant scenes

The detection and recognition of text from natural scene images constitute one of the main tasks that need to be fulfilled in order to proceed with our project. Developing a robust scheme for extraction and recognition of text from camera captured scenes is a great challenge due to several factors which include variations of style, colour, spacing, distribution and alignment of texts, background complexity, influence of luminance, and so on.

The foremost task we faced was the pre-processing of the captured image from the camera. We, first, implemented a basic thresholding technique, which simply converted the image to 8-bit grey-scale using the formula $G = 0.299 * R + 0.587 * G + 0.114 * B$. This binarization method was not quite useful, as the text often got blurred, in cases where the text components were connected with the background.

A global binarization method like the Otsu's technique is not quite suitable for camera captured images, since the grey-value of the histogram of such an image is not bimodal. Binarization of such an image often leads to loss of textual information against the background.



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However, we observed that applying Otsu's method for the second time on both sets of foreground and background pixels of the image, after binarization, often recovers lost text effectively. The second time use of Otsu's method as described above converts several pixels from fore-ground to background and also vice-versa.



Fig. 1. (a) Original Image



Fig. 1. (b) Image after using Abbyy FineReader

The camera used for this purpose was the Microsoft LifeCam Studio Webcam. For text detection from the image, the open source Optical Character Recognition engine, Abbyy FineReader was used. The pre-processed image was then fed into the OCR engine and the detected text was displayed into a .txt file or a .doc file. The efficiency of the OCR engine depends on the quality of the image entered, the fonts of the image, the background colour and texture and so on. Overall, on an average, the efficiency of the total system was judged to be around 90-95%. This entire image processing and optical character recognition technique was implemented using the Abbyy FineReader software.



5. Design of the Braille Glove

5.1 Brief Introduction to Braille

The Braille code is the main medium of communication for the blind and visually-impaired who read and write using tactile means. A visually handicapped person is taught Braille by training him or her in discerning the cells by touch through his or her fingertips. A printed sheet of Braille normally contains upwards of twenty five rows of text with forty cells in each row. The physical dimension of a standard Braille sheet is approximately 11 inches by 11 inches. The dimension of a Braille cell, as printed on an embosser is shown below.

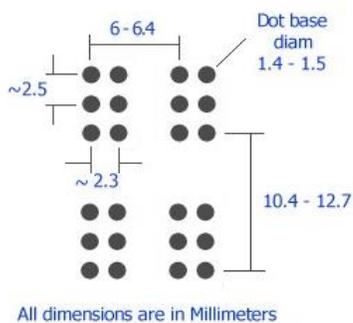


Fig 2. Braille Cell

a	b	c	d	e	f	g	h	i	j
⠁	⠃	⠉	⠑	⠅	⠋	⠗	⠈	⠊	⠎
k	l	m	n	o	p	q	r	s	t
⠅	⠇	⠓	⠟	⠍	⠕	⠖	⠞	⠡	⠢
u	v	x	y	z	w				
⠥	⠦	⠘	⠣	⠮	⠵				
,	;	:	.	en	!	()	"	in	"
⠸	⠹	⠺	⠼	⠻	⠽	⠾	⠿	⠰	⠱

Fig 3. Braille Code

The six dots forming the cell permit sixty three different patterns of dot arrangements. Strictly, it is sixty four patterns but the last one is a cell without any dots and thus serves the purpose of a space. A Braille cell is thus an equivalent of a six bit character code. In Standard English Braille, many of the sixty three cells will correspond to a letter of the Roman alphabet, or a punctuation mark. A few cells will represent short words or syllables that are frequently encountered in English. This is done so that the number of cells required to show a sentence may be reduced, which helps minimize the space requirements while printing Braille.



5.2 *Basic Idea behind the Braille Glove*

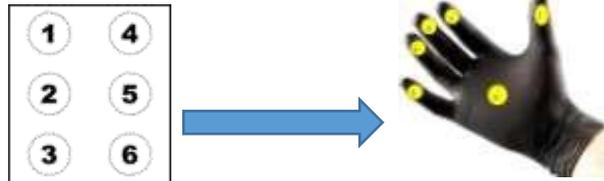


Fig 4. Hand Glove with Six Positions

The six dots forming the cell permit sixty three different patterns of dot arrangements. The combination of the dots correspond to the alphabets, numbers and special symbols of the English language. The Braille glove contains six vibration motors, of which five are fixed in the five fingers and one on the centre of the palm. After the OCR system has deciphered the text from camera images, each character of the text is then converted into the corresponding Braille code and the relevant vibrator motors are activated. So based on the position of vibrations, the blind person can understand the value of the letter. For example if the detected letter is “r”, it is converted into Braille value 1,2,3,5 and this value activates the corresponding motors in Braille hand glove. Any blind person can wear this glove in right hand, and understand the English letters through vibration instead of touching the Braille sheet. Similarly a whole word or sentence can be converted into Braille vibration to intimate the user.



Fig 5. Braille Glove

6. Architecture and Design

The entire design consideration is based on higher wearability and flexibility of use. The processor used for development of the prototype is the ARM11 Tiny6410 Single Board Computer. This is a S3C6410 ARM11 development board with a 4.3" TFT LCD. This board comes with a 256MB DDR RAM, 2GB NAND Flash, WinCE / Linux / Android support, advanced Video / graphic support with 3D acceleration. The processor enables the webcam to capture the images from the distant scenes, by focussing and zooming in for better performance. The captured image is then pre-processed and the optical character recognition is applied on it. The result of the OCR system is stored for future purposes in the processor memory. The text is then sent to the ear piece via Bluetooth and the text is read out to the user. The text generated from the OCR system is also encoded alphabet-wise, as mentioned in section 5.1. According to the code generated, the corresponding motors in the glove are activated and the pulses intimate the user of the detected text, via the Braille system.



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To support the wearable technology, the design of the system is made in a compact structure to facilitate manoeuvrability and ease of use. The camera is fixed to one eye of the user by a head-band. This will enable the user to focus on the natural scene image more efficiently and capture the image. The processor is embedded inside a plastic casing, with buttons and switches for control of the entire operation. The plastic case can be attached to the belt of the user or kept inside his trouser pocket. The Glove is worn on his hand with the wireless Xbee module attached to upper portion of his wrist. The entire connectivity of all parts of the system are done wirelessly, via Bluetooth and Xbee modules. Thus, this design features an ease of movement and flexibility.

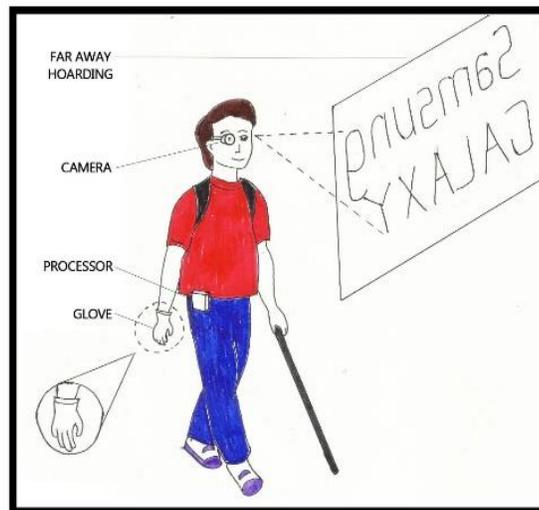


Fig 6. Pictorial representation of the functioning of the device



7. Results

Initial test results carried out on this system in indoor environment has proven quite successful. The results for the pre-processing and optical character recognition indicate an average of 95% efficiency. The generation of the Braille code as well as the vibratory feedback have provided fruitful outcomes.



Fig 7. Components of the Reading device

However, the latency of the entire process is quite a bit on the higher side. We are in the process of completing a thorough experimental evaluation of the latencies for text detection, OCR as well as generation of the Braille code. We expect that the results will enable us to further do research on this subject and help in reducing the latency. We acknowledge that we are yet to perform any systematic or comprehensive end-user testing of our device. We intend to test this system in an outdoor setting and evaluate the feasibility of using this device in an urban terrain.



8. Conclusion and further improvements

This system aims to develop assistive technologies for the blind to provide a greater degree of independence in their daily activities. This will enable the visually-impaired users to read text not only from books and papers, but also from billboards and signs at a greater distance. The use of everyday objects in the development of this device will also reduce the cost of manufacturing the device, thus making it available to people at reasonable price.

Although the results are promising, the system requires further tests and improvements. For further development, we intend to design a customised electro-tactile grid-array to provide Braille pulse patterns to the finger-tip. This will make the device more comfortable and efficient for the user, thus replacing the Braille Glove. Thus, we intend to develop a thimble like wearable device for the finger, with an electro-tactile grid array on the finger tip.



Fig 8. Design of the Electro-tactile grid in the wearable device for the finger

We have achieved the development of the prototype of the device as we had planned in the beginning. Now, our aim is to build the wearable thimble-like electro-tactile grid device, and also make the entire system of the camera to the processor more compact. We believe this extension of the project can be completed within around 6 to 9 months.



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CHAPTER-3.3

PROJECT PROGRESS REPORT

OF

AUTOMATIC FOUL DETECTING SHIN

PAD FOR FOOTBALL



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IEDC Project Report

Of

Automatic Foul-Detecting Shin pad for Football

**Prepared By: Rohit Sarkar B.Tech(IT) Fourth Year, Shoumik Ghosal
B.Tech(ECE) Third Year, Somjit Bhowmick B.Tech(ECE)
Third Year**





1. Introduction

As we know, football is a game of stamina, power and skills. To keep it a fair game, there are certain rules and regulations regarding the extent of force that can be applied in case of physical contact and the places of a player's body that can be attacked, legitimately.

According to association football rules, A foul is an unfair act by a player, deemed by the [referee](#) to contravene the game's laws, that interferes with the active play of the game. Fouls are punished by the award of a free kick ([direct](#) or [indirect](#) depending on the offence) or [penalty kick](#) to the opposing team. A list of specific offences that can be fouls are detailed in Law 12 of the Laws of the Game (other infractions, such as technical infractions at restarts, are not deemed to be fouls), these mostly concern unnecessarily aggressive physical play and the offence of handling the ball. Additionally, a foul can only be committed by a player (not a substitute) and on the field of play, while the ball is [in play](#). Where applicable, fouls are limited to acts committed against an opponent (for example, a player striking the referee or a teammate is not a foul, but is misconduct).



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A foul in football generally involves an illegal physical contact made by a defending player in an illegitimate way which poses the possibility of injury on the player attacked.

2. Categories of Fouls:

A [direct free kick](#) is awarded when a player commits any of the following in a manner considered by the referee to be careless, reckless or using excessive force:

- Kicks or attempts to kick an opponent
- Trips or attempts to trip an opponent
- Jumps at an opponent
- Charges an opponent



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- Strikes or attempts to strike an opponent
- Pushes an opponent
- Tackles an opponent

Or commits any the following offences:

- Holds an opponent
- Spits at an opponent
- Handles the ball deliberately (except for the goalkeeper within his own penalty area).

In determining whether or not a player deliberately handled the ball, the referee has several considerations:

- Movement of the hand towards the ball (not the ball towards the hand)
- Distance between the opponent and the ball (unexpected ball)
- Position of the hand ('natural' position versus 'unnatural' position) does not necessarily mean that there is an infringement
- Touching the ball with an object held in the hand (clothing, shinguard, etc.) counts as an infringement (considered an extension of the hand)
- Hitting the ball with a thrown object (boot, shinguard, etc.) counts as an infringement (also considered an extension of the hand)

If a player commits a direct free kick offence within his own penalty area, a [penalty kick](#) is awarded irrespective of the position of the ball, provided the ball is in play.

Indirect free kick offences

Fouls punishable by an [indirect free kick](#) are:

- When a goalkeeper, inside his own penalty area:
 - controls the ball with his hands for more than six seconds before releasing it from his possession



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- touches the ball again with his hands after he has released it from his possession and before it has touched another player
- touches the ball with his hands after it has been deliberately kicked to him by a team-mate (the [back-pass rule](#))
- touches the ball with his hands after he has received it directly from a throw-in taken by a team-mate
- When any player in the opinion of the referee:
 - plays in a dangerous manner
 - impedes the progress of an opponent
 - prevents the goalkeeper from releasing the ball from his hands
 - commits any other offence, not previously mentioned in Law 12, for which play is stopped to caution or send off a player

3. Referee's discretion:

The referee has a very large degree of discretion as to the interpretation of the 17 Laws including determining which acts constitute cautionable offences under the very broad categories. For this reason, refereeing decisions are sometimes controversial. Some Laws may specify circumstances under which a caution should or must be given, and numerous directives to referees also provide additional guidance. The encouragement for referees to use their judgment and [common sense](#) is known colloquially as "Law 18".



4. Proposed Product:

We have been working on an **automatic foul detecting shin pad** for footballers which will contain its own data processing, transmission, receiver and sensor units.

This shin pad senses any illegal physical contact made above a threshold level of force applied and notifies another device/micro-controller capable of serial communication wirelessly. The quality and wearability of this shin pad is not compromised in any way and thus they won't violate the association rules on any ground. The front portion of the shin pad worn by the player is covered with a pressure sensitive material which generates and change in signal to the MCU located in a hidden chamber, which cannot be tampered with without flagging a tamper alert or damaging the shin pad completely. The foul detection data and the name/jersey/serial no. of the player committing the foul and the player experiencing the foul are sent to a handheld electronic device (PDA, Tablet, or smartphone) the referee is carrying.

A great no. of vital football matches have been won or lost unfairly due to wrong foul decisions or lack of a proper witness to a foul-play. Thus, even though sometimes, referees miss out on fouls and there are ambiguities regarding the genuineness of a foul appealed for, this system offers a fair and unbiased objective decision for the referees. The algorithm is designed in such a way that cases which can be mistaken as a foul are systematically ignored. Only genuine fouls are notified. And it should be mandatory for all the players to wear these standardised and tested shin pads for a football match.



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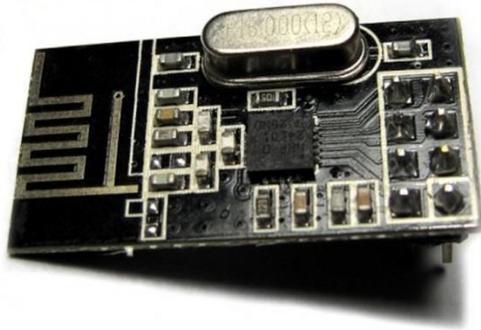
A typical footballer shin pad. The front portion witnesses any foul play during a match.



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5. Progress So Far & our Approach

We have built a prototype shin pad unit which is capable of sending a foul contact signal to the referee's receiver unit. We have made this transfer of data wireless with the help of nRF24L01 module which is capable of sending digital data at a carrier frequency of 2.4 GHz through 6 parallel data pipes.



An nRF24L01 Module with Printed UWB Patch antenna



Conductive cloth used as a medium to obtain electronic signals from the shin pad



The Pressure sensitive sheet which changes resistance with applied pressure.

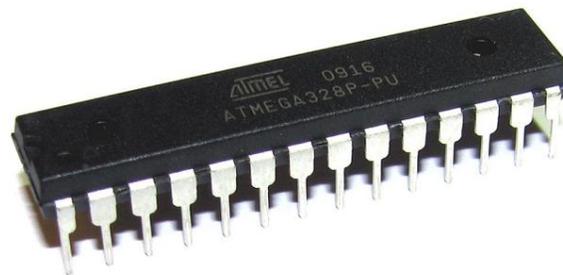


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Pressure sensitive sheet has been included inside the shin pad to sense incoming contacts and generate analog voltage signals with the help of a simple voltage divider circuit. As the resistance across the pressure pad changes, the voltage drop across the same changes too and thus we feed this voltage into the microcontroller which is programmed to flag a foul whenever the voltage reaches above a certain threshold level.

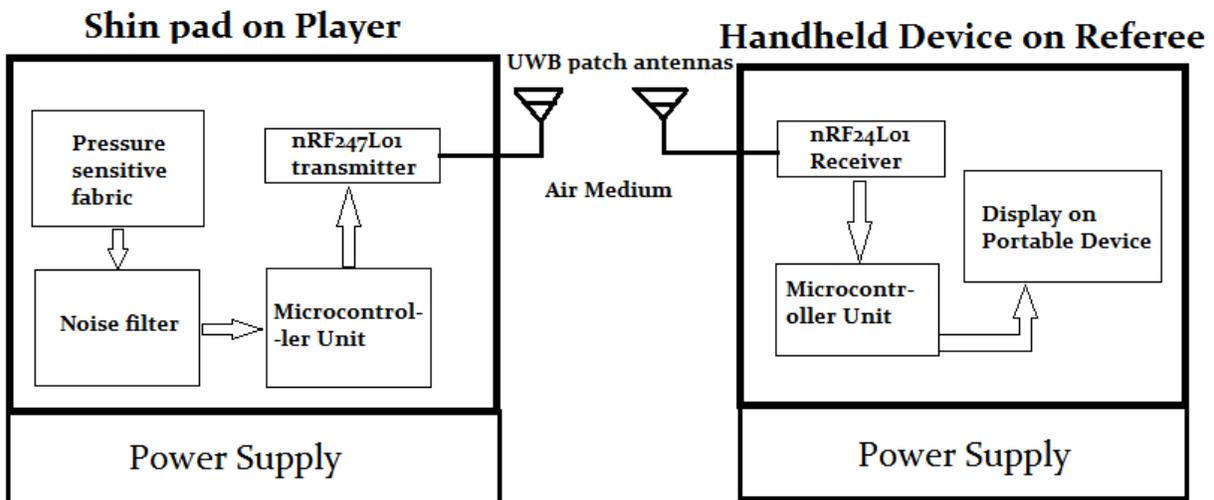
The ATMEGA328 micro controller used for our purpose

When the referee's receiver module receives two simultaneous (or at very short intervals) illegitimate contact notifications from two players of opponent teams each of whom and assigned and a separate frequency channel, a foul is called, and the second player shin guard to notify a foul contact is the defaulter.



All the players broadcast their current pressure status to the referee module who listens to all the channels by timesharing all the channels used in the nRF module.

Now, due to the pressure difference between the air-filled football and an opponent's leg, the microcontroller can easily differentiate between a ball contact and a foul foot contact.



Basic Block Diagram of the Proposed Product

6. Features of this Product :

- Light-Weight Circuitry
- Battery last long enough for two consecutive matches
- Microcontroller runs at a clock speed of 16 MHz, Hence very fast response
- Objective and unbiased approach to foul judgement based on physical evidence.
- Any attempts to tamper with the circuitry inside the shin pads would disrupt the broadcast signals continuously sent to the referee and thus he will be notified immediately
- Low Cost
- Can be repaired and parts replaced easily in case of damage.



7. Where does the importance of this Product lie?

- Sometimes referees miss out on fouls committed by player and thus matches of international importance loses its balance of fair and unfair.
- Avoids Human errors
- Ensures genuineness of decisions on which the fate of an importance football match may rely.
- Encourages players to play fair and clean.
- Ensures the absence of conflicts within the minds of the fans and avoids discontent and fan outrage.

8. Future Aspects:

We have planned some substantial improvements on this Automatic Foul Detecting System like extending the sensor zed region from the shins to the shoes. The front portion on the shoes is also used to commit fouls by players. This would ensure fool-proof detection.

We have also planned to design the product with a liquid gel/foam protection from the wearer's feet to avoid noise inputs and erroneous broadcast. The outer exposure of the sensor region would be retained though, to preserve pure analog readings.

We are also planning to incorporate an auto calibration procedure by which the shin pad will automatically calibrate its threshold voltages and ranges to match the foot shape of the wearer. And lastly, we have planned to incorporate the latest viable battery technology, i.e. nano film lithium ion battery to ensure light weight, fast charging and long run times.

To incorporate all these enhancements to our project and design a truly optimized and market-ready product, we seek a time period of at least **6-8 months** more.



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CHAPTER-3.4

PROJECT PROGRESS REPORT

OF

BLUETOOTH AIDED SWITCHLESS

HOME



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IEDC Project Report

Of

Bluetooth Aided Switchless Home

Prepared by: Susmit Bhattacharya B.Tech (ECE) Third Year,

Shashwata Gupta B.Tech(ECE) Third Year,

Rohit Sarkar B.Tech (IT) Fourth Year





1. Introduction

Power wastage, due to indiscriminate usage of home and office appliances, and human error in operating them, accounts for a large chunk of energy usage throughout the world. This energy can easily be conserved by judicious and careful operation of electrical appliances, and taking care to switch them off when not in use. Though it may seem easy to implement, it is not the case in most households, especially those housing busy professionals, and also in case of large offices.

To combat the issue, we have proposed a novel method to switch off appliances when not in use. Moreover the perceived human reluctance in moving around a considerably large room switching appliances, has also been dealt with.

2. The need for a Bluetooth-aided Switchless Home

- **Power Conservation:** A large amount of power is wasted merely by human forgetfulness. Switching off appliances when not in use, and providing the facility of remotely controlling the appliances at will, from a smartphone app, will greatly reduce the consumption of wasteful power.
- **Accidents:** It is dangerous to leave some high power devices, like microwaves, induction cookers, pumps, motors, ACs etc in operating state when no supervisors present. Heating effects and high currently pulling characteristics of such devices may risk the outbreak of a severe accident, such as a fire.

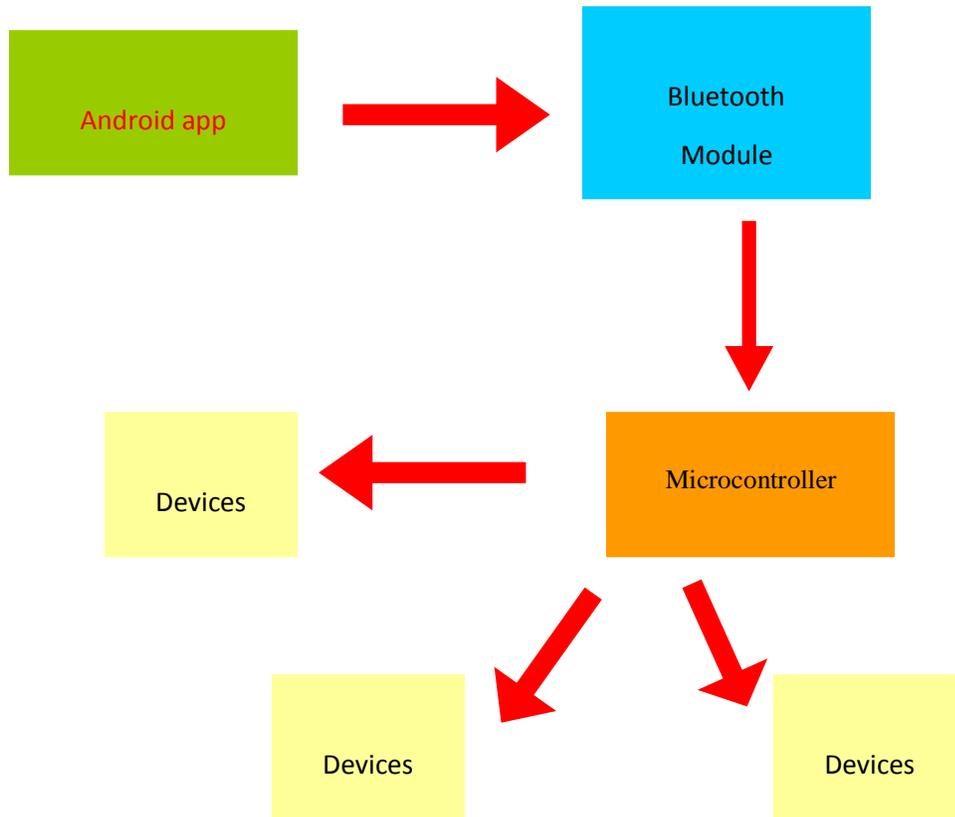


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- **Unnecessary utilization of other resources:** Apart from electricity, other resources may also be mis-utilized due to human error and reluctance. A common observed example is overflowing of water tanks after being filled up with ground water.
- **Human forgetfulness:** Busy professionals will often tend to be immersed in many other important jobs and thereby it will be quite common for them to forget switching off household devices when leaving for long durations. Office buildings may be affected in similar ways by amplified means.
- **Massive effort reduction,** especially in switching office appliances, will be possible, preventing reluctance in physically doing so. The easy way of having a phone app to have access to all devices will be a piece of cake to most.



3. Operation Flow of our system





4. Intended working of the project

- The phone app will act as an interface providing virtual switching control over all appliances of the operation area. The user will be able to switch ON/OFF any devices in house via a GUI.
- Instantaneous response of user commands inside the premises, will be carried out. The device states will be maintained as long as the user stays in the area.
- Once the user moves out of the premises beyond a pre-defined threshold distance, all pre-programmed devices will be switched off automatically.
- The above situation implies that user has forgotten to switch off certain devices, or left in a hurry. Thus, to conserve power, all devices will be switched off.
- Certain devices might be pre-programmed to remain ON even after the user has left the premises.

5. Progress of the project so far

- All necessary raw materials have been procured and arranged for.
- The basic prototype has been built. It is what internal circuitry of the final product will be.
- The current functionalities include basic switching operations from user end.
- The automated switching off of all pre-programmed appliances when the user leaves the premises, has been implemented successfully.
- Quite high accuracy in estimating the exit of user, customized for various room types and households, has been developed.



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- A skeleton app is used to manage operations from smartphone end. It's a very basic and coarse version at present. A lot of GUI support will be added for easier and friendlier user interaction.

6. What remains to be done

- Packing of all prototyping materials into a single and compact unit has to be done before marketing.
- Full scale implementation at a typical home with connections to various appliances of varying power consumption has to done. This will be used for final testing phases.
- Battery backup for the system to act independently for long periods. Note: the internal power consumption of this device is extremely low $\sim 2 - 5$ W depending on different connections. The power consumption of the system itself is quite negligible compared to the amount of power it conserves.
- The smartphone app needs to be more user friendly and with attractive GUI.
- Enabling pre-programming of certain appliances via the app itself.



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CHAPTER-3.5

PROJECT PROGRESS REPORT

OF

SMART HOME SECURITY SYSTEM



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IEDC Project Report

Of

Smart Home Security System

**Prepared by: Saptarshi Hazra B.Tech (ECE) Third Year,
Soumayan Dutta B.Tech(ECE) Third Year**





1. INTRODUCTION:

Security issue in modern era is a big concern everywhere. Given the alarmingly increasing rate of theft and burglary in our city or state or even in the country; it is of prime concern nowadays to resolve the menace. Be it the hi-tech corporate offices, religious places or simple households-- no place is actually secure anymore.

Here, to protect your most treasured place, we have a tech-solution to the problem of theft or break-in, which enables to control your home or room from anywhere and everywhere. Our '**Smart Home Security System**' also enables the user or consumer to detect any unwanted fuss or mishap in his house and take steps accordingly.

2. DETAILED FEATURE LIST OF THE PRODUCT:

➤ Highly Secure :

The product is having state of the art motion sensors, glass break sensors, anytime there is a break-in or burglary attempt the lock immediately sends sms to the list of all users available to it, so even if one of them is busy working and not able to respond others definitely will. It has buzzers which sets off when the break-in occurs alerting the neighbors.



➤ **Cell phone- the ultimate key:**

Many of us have the habit of losing the key, but we rarely forget our cell-phone as it is very important in our life so why not use the cell phone as the key. Yes that's exactly what this product does so keeping things simple, we simply type in the password and send it to the lock and that's it. To know the status of the lock we simply have to type in STAT and we will the current statistics and the last 5 operations it performed.

➤ **Remote Access :**

Suppose we are out and suddenly someone important comes to our home they will have to wait until you return just we send a sms and the door opens how convenient is that? There are countless cases where the remote access will come handy.

➤ **Unique Identification :**

The cell phone number is the unique code by which the lock identifies whether the sms sender is a authentic user or not. The lock can hold a maximum of 5 numbers who can access the lock. Even someone other than the list tries to access the lock even if he/she has the correct password the lock will not give them access. SMS will be sent to the users about the invalid try and given the phone number of the invalid user to the users.



➤ **Hacking-Not a chance :**

SMS is the most secure form of communication and the network service providers take money for maintaining it secure and safe so why not use this? This obviously saves us thousands of rupees making the product safe and affordable.

Again most of the hacking occurs where there is network, cloud and server associated with the system. But in our system we have no such things the microcontroller stores all the data in the EEPROM and it itself is hardware locked so there is no chance of retrieval of information and compromising on the security.

➤ **Feedback System :**

While talking, we always want some feedback from the listener, same is true in every aspect of life. While closing the door or opening the door we are not entirely sure if the system did it or not, but this system sends sms every time it performs an operation.

➤ **Fire Alert and LPG Alert :**

Many accidents occur by the mentioned causes, the system always keeps track of the temperature and the LPG gas content in the air .If a fire occurs or LPG gas leaks it immediately informs the users. Thus giving, at least the chance of avoiding the accident.

➤ **Ease of Access :**

The system also has an alphanumeric keypad for normal access. It will also be used to change password and numbers, the system has an LCD interface for easy change of password and number change.



➤ **Affordability :**

The system costs almost 3times less than those available in the market, so the normal citizen having moderate pay package can afford them which is obviously not the case with the other systems which is targeted at the rich people.

3. WHAT WE HAVE ACHIEVED:

❖ **A Comparative study between originally proposed plan and actual progress :**

➤ **Lock and Unlock feature :**

As per the originally proposed plan, the locking and unlocking feature of any door or window or device at home has been implemented successfully.

➤ **Various sensors :**

1. **Motion sensor :**

Using a simple PIR sensor, which works on the principle of detecting change in thermal content of background only, we have successfully designed a working prototype of motion sensor. PIR sensor, when finely tuned, is thus able to detect very subtle changes and trigger accordingly.



2. **Temperature and LPG sensor** :

Temperature and LPG sensors will successfully be implemented according to the plan chalked out in the next phase.

➤ **One and multi-user usability** :

For security purpose, the proposed one-user usability in the GSM security lock has been implemented successfully through a working prototype.

Multi-user usability is still in the testing phase, which is to be implemented in the GSM lock in next phase.

➤ **Easy password and number-locking feature** :

Proposed feature of easy password through simple number-locks has successfully been implemented. This can be reset by the user also: thus making the product more user-friendly.

➤ **Alpha-numeric keypad access to the system** :

Assuming possible security breach through alpha-numeric keypad, installed with the lock itself, this feature has been removed.



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✚ So, on a conclusive note, we can say that the prototype of “**Smart Home Security System**” is display-ready. It has been successfully implemented at microcontroller-level based applications. Final designing of market-ready product : the printed circuit board is in the making.

➤ **A Quick View :**

Proposed Roadmap	Actual Progress
➤ Buying necessary items	Done
➤ Start with basic lock and unlock feature with a bare minimum code	Done
➤ Implementing motion sensing and glass-breaking detection system separately	Done
➤ Integrating and debugging the previously developed systems	Done
➤ Integrating temperature detection and LPG sensing with the model	Work in progress
➤ Adding one-user usability only	Done
➤ Second phase of testing and further debugging	Done
➤ Adding the easy password and Number-locking feature	Done



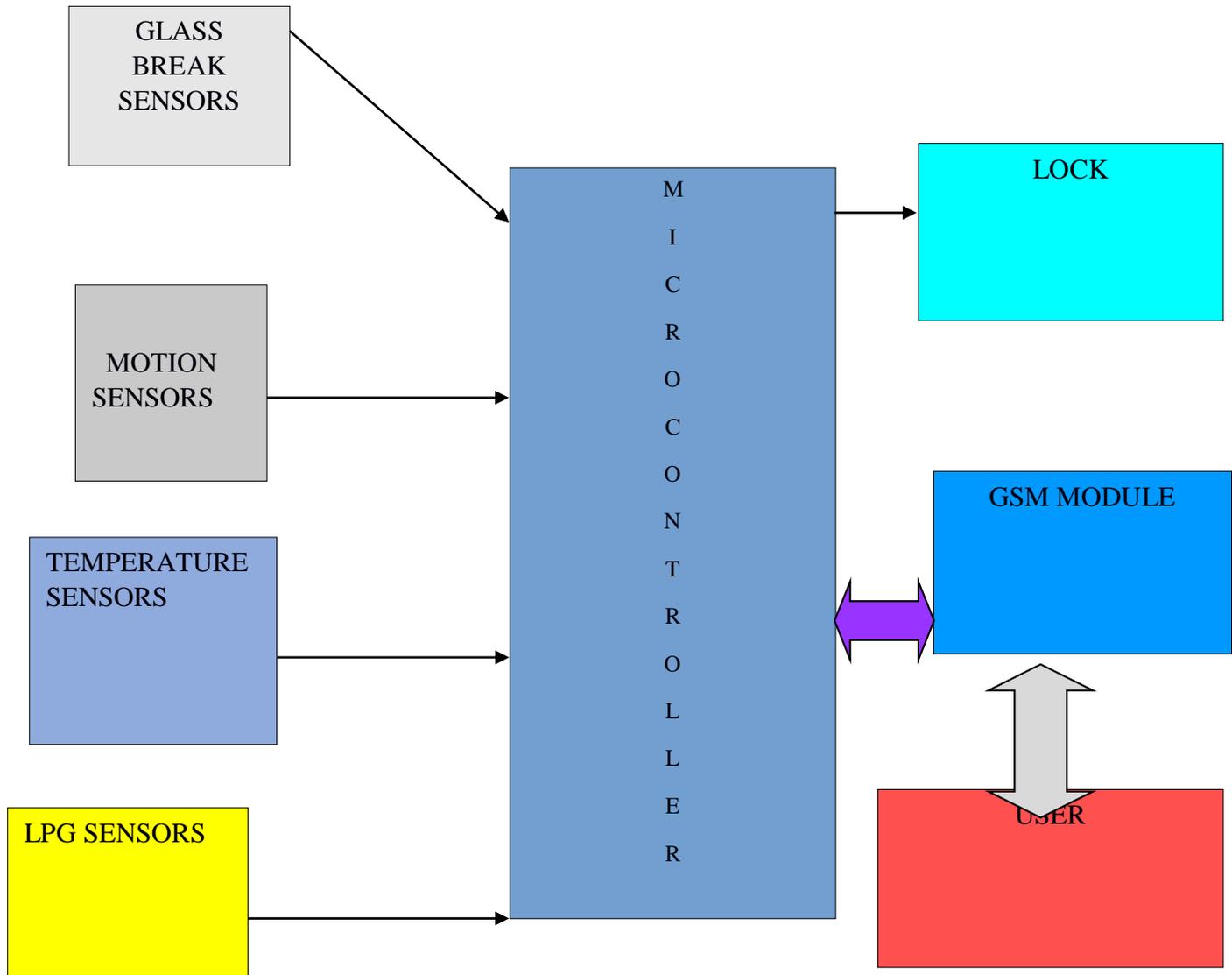
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➤ Testing with different locks and multiple devices	Done
➤ Third phase of prototype testing	Done
➤ Adding keypad access to the system	Cancelled due to possible security breach
➤ Adding multi-user usability	Work in Progress
➤ Designing and finalizing PCB (Printed circuit board module)	Work in Progress



4. HOW WE ARE ACHIEVING OUR GOAL :

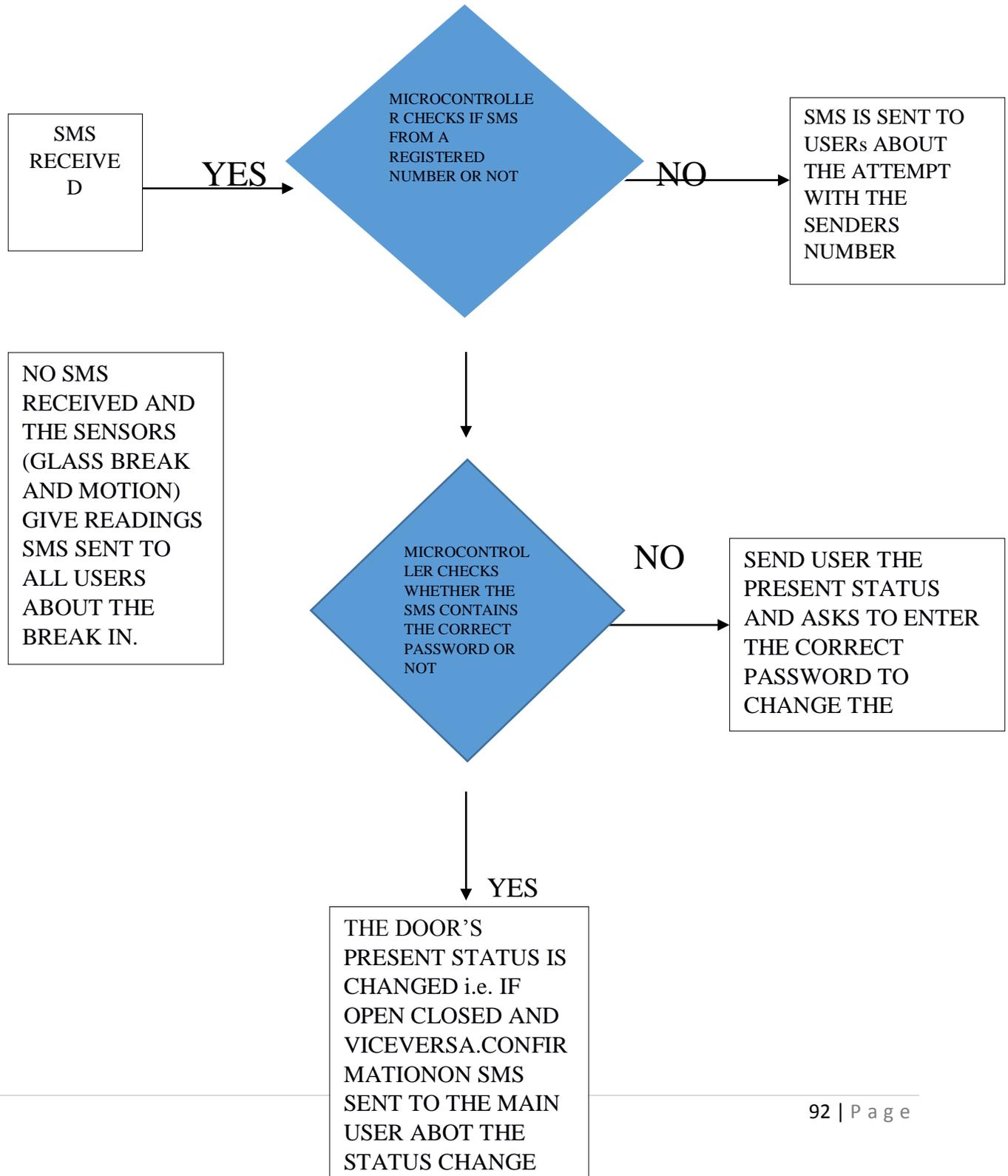
➤ **OVERVIEW OF THE SYSTEM AND PROCESS FLOW :**





5. Block Diagram : Working of “Smart Home Security System “

➤ THE BASIC OPERATION ALGORITHM :





6. STEPWISE WORKING :

1. The system is turn on receiving a message. The system will crosscheck the sender's number with its own list is none of that matches SMS will be send to the users about the sender and will be sent his/her phone number.
2. Even if phone number matches the system does not change the system status be it off or on, it checks the password if only that matches then only the system will give access to the lock. If that doesn't match it will send the sender "invalid passipword".
3. If the system status changes without proper SMS or keypad authorization or the glass-break sensors and motion sensors detect something immediately SMS will be sent to the entire list of phone numbers about the break in. Buzzer will be sounded to alert the neighbours.
4. SMS and gsm services are particularly well secured by the network service providers so they almost cannot be hacked into. So this gives the security system of almost 0% fail rate without paying for extra security measures as the cellular company already takes the security measures for us.
5. Secondly as there is server or cloud connectivity individual systems are isolated and hence almost impenetrable.
6. If the temperature sensor and LPG sensor find some sudden spike in readings it will alert the user about the possibility of fire or gas-leak.



7. TECHNICAL ASPECT:

- We have used Atmega 64 for our purpose in this project, it has 2KB EEPROM which is required also it has 50 I/P pins which are a necessity for accommodating the large number of sensors and our output devices.
- Firstly we have saved the list of numbers into the EEPROM of the microcontroller also we have saved the password into the microcontroller.
- The microcontroller is connected with a GSM module (SIM 900) holding a sim , the microcontroller can access the SMS received by the SIM by the USART protocol. The GSM module is controlled by serially transmitting AT commands by the microcontroller.
- The microcontroller continuously reads data from the sensors and the GSM module, if a SMS comes in it immediately knows that and reads the message by transmitting appropriate AT commands.
- At first it saves the number and the password received into the memory, then cross checks it with all the numbers stored in the list, if it matches it checks the password otherwise it sends SMS to all the users about the number that tried to access the lock.
- If the password check is completed and successful, it changes the status of the door and



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sends SMS to the users about the change, if password doesn't match it sends SMS to the user "invalid password".

- Now if the readings of glass-break sensors, motion sensors become high the system sends SMS to the users about this classifying it as break-in and sounding an alarm to make the neighbours know and help out.
- There will also be temperature sensors which when gets reading higher than expected it alerts the user about this fire.
- There will also be LPG sensor which when detects gas leak, controls exhaust fans to remove the gas and also sends SMS to the user about the gas leak.

8. NEXT PHASE PLANS :

➤ **Building and Testing the PCB:**

Building all the components used in the project in one single block with ease of plug in of sensors for quick change and testing the system is of foremost importance now. This adds to the overall marketability of the product.

Testing the system is a time extensive job particularly as the customers would be trusting the security of their houses upon the product.



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ESTIMATED TIME REQUIRED: 6 months.

➤ **Making applications for ease of use of both the owners as well as maintenance people:**

An app for easy access as well as maintaining the logs on the cloud just adds even more to the security as we plan to implement a facial recognition on the app thus doing away with our drawback of the system being vulnerable when the user's phone is stolen. As well as maintaining the logs will help in keeping everyone using the lock connected on the go.

We plan to implement an cloud based checking of the logs to maintain the proper functioning of the lock as well as alert the service center in case of any emergency. So that the customer can be in peace that his house is in safe hands.

This process will go parallely with the testing of the system

ESTIMATED TIME REQUIRED: 6 months

➤ **REMOTE TESTING OF THE SYSTEM AND FIRMWARE UPDATE:**

We plan to implement a remote testing system on the cloud to test the system's performance from time to time and get an overall status report. It enables us to know if there is any fault where the fault lies example if the temperature sensor is not working we will come to know that automatically and instantly.

The system will also be able to debug as many software errors that occur using the operation of the system. Also we will be actively developing the system to deliver the best to our



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customers and after any major changes on the software we will provide OVER THE AIR update to the present system installed; thus always ensuring customer satisfaction.

ESTIMATED TIME REQUIRED: 6 Months.

➤ **Rigorous industrial testing of the lock:**

After the completion of the development process we will go for industrial testing in three phases with the final one being marketed. The errors generated will be subsequently taken care of.

Industrial testing is a long process involving rigorous testing and development.

ESTIMATED TIME REQUIRED: 12 Months.

➤ **Designing :**

After development of the functional prototype proper designing of the product is necessary, as a well-designed product sells more than a badly designed functional one.

This process will take place parallelly with the industrial testing.

ESTIMATED TIME REQUIRED: 12 Months.



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➤ **Marketing the Product :**

A proper marketing campaign makes the road wider for the product into the market thus making us reach the mass population of the country. This will take considerable time and will start as soon as we are ready with the product.

ESTIMATED TIME REQUIRED: To reach the break-even point, we estimate 24 months of time from getting the final product ready, will be sufficient.

Marketing is the blood vessels of the product and go as long as our product is alive in the market.



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