KUMARAGURU college of technology

NEWSLETTER

Electrowaves - 27

Technical Magazine *July - September 2020*

Department of Electrical and Electronics Engineering

Editorial Message

The Department of Electrical and Electronics has recorded consistent improvement in its academic, research and placement performance. Department offers a range of innovatively designed programs whose curricula are constantly updated to meet the changing requirements of the industry and also meet the needs of major stakeholders.

When publishing these newsletter's only thing we had in mind was that the Newsletter should reflect the outlook of the department in all aspects. Hereby, we the editors take the responsibility of ensuring the continuity of the issues in the years to come with improvements and richness every time. We are pretty sure that you will get lot of useful information reading it. However, our work does not end here. We consider that our endeavors will be successful only when, after reading these articles you get motivated to contribute more such articles in future issues.

"The world is yours, Aspire big"

Dr. K MALARVIZHI
Head of the Department

Vision

To be a Centre of Excellence in Globalizing Education and Research in the field of Electrical and Electronics Engineering.

Mission

The mission of the department is to

- **E**mpower the students with state-of-art knowledge to excel as eminent electrical engineers with multi-disciplinary skills.
- **E**mphasize social values and leadership qualities to meet the industrial needs, societal problems and global challenges.
- **E**nable the technocrats to accomplish impactful research and innovations.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Our graduates will be able to

- Pursue a diverse range of careers in engineering, consultancy, and entrepreneurship.
- Contribute to continuous professional development through higher studies and life-long learning.
- Demonstrate their technical proficiency with ethical values and social responsibility.
- Innovate and provide solutions for ever-changing global environments with familiarity in computational platforms in electrical engineering.

Programme Outcomes (POs)

- **ENGINEERING KNOWLEDGE**
  Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PROBLEM ANALYSIS**
  Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

Programme Outcomes (POs)

- **DESIGN/DEVELOPMENT OF SOLUTIONS**
  Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS**
  Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **MODERN TOOL USAGE**
  Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- **THE ENGINEER AND SOCIETY**
  Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

Programme Outcomes (POs)

- **ENVIRONMENT AND SUSTAINABILITY**
  Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

- **ETHICS**
  Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

- **INDIVIDUAL AND TEAM WORK**
  Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- **COMMUNICATION**
  Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

- **PROJECT MANAGEMENT AND FINANCE**
  Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

- **LIFE-LONG LEARNING**
  Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

Apply the knowledge acquired in Electrical and Electronics Engineering to technological advancements.

Identify suitable solutions for design and control of electrical and electronic systems

Machine Vision based Visual Quality Inspection System for Automotive Component Manufacturers

MOHAMED AMEEN J, 2016 – 20 Batch

With the advent of automation in every aspect of manufacturing, the Quality Control process in most of the manufacturing industries remains labour and time intensive. This article describes a machine vision-based inspection system for identification of cracks and other three-dimensional topographic anomalies on glossy metallic surfaces using two unique modes of lighting: Cloud Day Illumination (CDI) and Running Zebra Lighting. The system uses an industrial grade machine vision camera for Image acquisition and NI's LabVIEW for image processing, prediction, detection and a basic microcontroller unit for actuation and input feeding.

This system will reduce the product cycle time by 15% which would significantly increase the product throughput of the automotive component suppliers. Also, there will be a reduction of manual labor dependency at a proposed ratio of 4:1, thus cutting down the overall operational costs by around 40%. This also reduces the overhead of maintaining manual labor and other secondary tasks with respect to labor (Logistics, Health Checkups, Provident Fund, etc..,).

Quality checking process in automotive component manufacturing Tier 1 and Tier 2 industries (suppliers) involves intensive labor and time-consuming. Zero percent defect should be maintained every time these industries dispatch a product batch since defective products affect the contractual relationship between these industries and their OEMs. Hence these suppliers spend a lot of resources in the quality control process.

Deploying more labors using precise gauges are employed in most of these industries to overcome the defect and to improve the quality of the products to be dispatched. Apart from the overhead of managing manual labor, such methods take up to 30% of product cycle time and around 15% of the total labor. These directly account up to 40% of the operational costs throughout the product cycle.

In a particular use case pertaining to the electronic horn industry, there exists a critical auto component named 'contact pointer', which is an alloy of tungsten. Two of such 'contact pointers' are present in every electronic horn, and these complete the circuit to blare the horn. This pointer is riveted on to the holder clamp of the horn using a hydraulic press. This, at times, develops cracks and other topographical anomalies on the surface of the pointer. Every pointer undergoes a labor and time intensive manual visual inspection process taking up a chunk of the product cycle time. Since the pointer is a highly reflecting glossy metallic surface, our predecessors who tried to address this with machine vision faced issues with the lighting. Our unique modes of lighting coupled with image acquisition and deep learning methods seamlessly detects and classifies surface level anomalies in the contact pointers of the electronic horn.

In the electronic horn contact pointer, there are two possible common types of defect. One is open crack and the other will be 3-Dimensional topography errors such as bend. Hence, there is a requirement for a system which could detect both the errors effectively.

SIGNIFICANCE OF THE PROBLEM

Valued at around $100 bn, the automobile component manufacturing sector in India is growing at a CAGR of around 11% directly creating 1.5m jobs/year in India. As per the Ministry of MSME, about 50,000 of such industries exist in and around Coimbatore region alone. Though the industries in this sector opt for automation of manufacturing, the Quality Control processes in automotive component manufacturing MSMEs remain labour and time intensive. These manual dependent QC methods are highly prone to human errors, and data collected on existing scenarios suggest the same. Most Automotive Component manufacturing MSMEs go in on a zero-ppm contract with OEMs/Tier 1 suppliers. QC processes are directly coupled with the industry's reputation and thus the scope for automation for such redundant manual QC methods among the automotive supplier market is high. Apart from the overhead of managing manual labour, such methods take up to 30% of product cycle time and around 15% of the total labour. These directly account up to 40% of the operational costs throughout the product cycle.

In a medium scale automotive component manufacturing industry, around 15% of total employees are employed for the QC process alone. Nearly 30% of product cycle time is involved for each product to go through the quality checking process in a medium scale automotive component industry. In a Tier 1 horn manufacturing industry, each product is double checked by two workers and are supervised by another worker. Each day 8 workers work in two shifts of 4 hours. During QC, approximately 5 out of 1000 products are found to be defective.

Each person must check approximately 12,000 pieces each day. Regular eye testing must be done in order to maintain requires vision qualities. Workers com- plain about the eye pain and headaches they have after prolonged hours checking miniature cracks & deformations.

Despite having many resources employed in quality checking there are defective products that manage to dodge the checking and get dispatched. Once these products are found in the later stages, the OEMs have the authority to even cancel the contracts between them and they get lesser priority than their peers from other OEMs. Hence, maintaining quality is paramount for these suppliers. Industrial automation has more scopes and it has a large market if a suitable product is developed to meet all their requirements

GAP ANALYSIS

Probe based solutions

- CMM – Coordinate measuring machine requires trained labour to operate.
- Marposs M100 (Italy) – It operates based on probe mechanism (Testing with contact).
- BLUM Novotest (Germany) - It operates based on probe mechanism (Testing with contact).

Machine Vision based Solutions

- CVS trevista – especially suited for the inspection of surfaces which are difficult to check, for example, glossy metal surfaces.
- Ivisys(sweden) - requires a trained labour to operate it.

These alternatives have not been adopted by the beneficiaries owing to their high initial investment (They costs around 1 to 2 crores).

TARGET USERS

Target sector	Automobile Component Manufacturing MSMEs
Jobs to be done	• To inspect manufactured components prior to dispatch • Segregate inspected components under different labels
Pains	• Labor dependency • Errors in dispatched product

USE CASE

Surface Crack detection of Horn Contact pointer - Roots Industries India Limited (OEM & Tier 1)

In this case, the QC department is responsible for quality checking in the production line and it takes up to 30% of the product cycle time directly affecting the throughput. To ensure proper functioning of this department there are multiple other factors including the health and concentration of the employee comes into play. Thus, this mode of operation is highly prone to human errors. Issues with manual QC directly affects the company's reputation and thus the revenues of the owners.

EXPECTED OUTCOMES OR GAINS

Target Users	Outcomes	Gains
Tier 1 & Tier 2 Automobile Component Suppliers	• Reduction in product cycle time by ~15% • Reduced QC operational cost by ~85% • Increased throughput in product dispatch	• Reduced manual labor dependency • Improved contracts & relationships • Reduction in error margin in dispatch • Increased productivity

Reducing the product cycle time by 15% would significantly increase the product throughput of the automotive component suppliers. Our Solution reduces manual labor dependency at a proposed ration of 4:1, thus cutting down the overall operational costs by around 40%. This also reduces the overhead of maintaining manual labor and other secondary tasks with respect to labor (Logistics, Health Checkups, Provident Fund etc.)

USABILITY AND DEPLOYMENT CONSTRAINTS

TCO - Our solution is priced significantly lower than the market alternatives to leverage the target segment (MSME Tier 1 & 2 OEM Suppliers). This is achieved by the usage of mobile camera modules instead of Industrial grade cameras which provides the same functionality at a fraction of the cost.

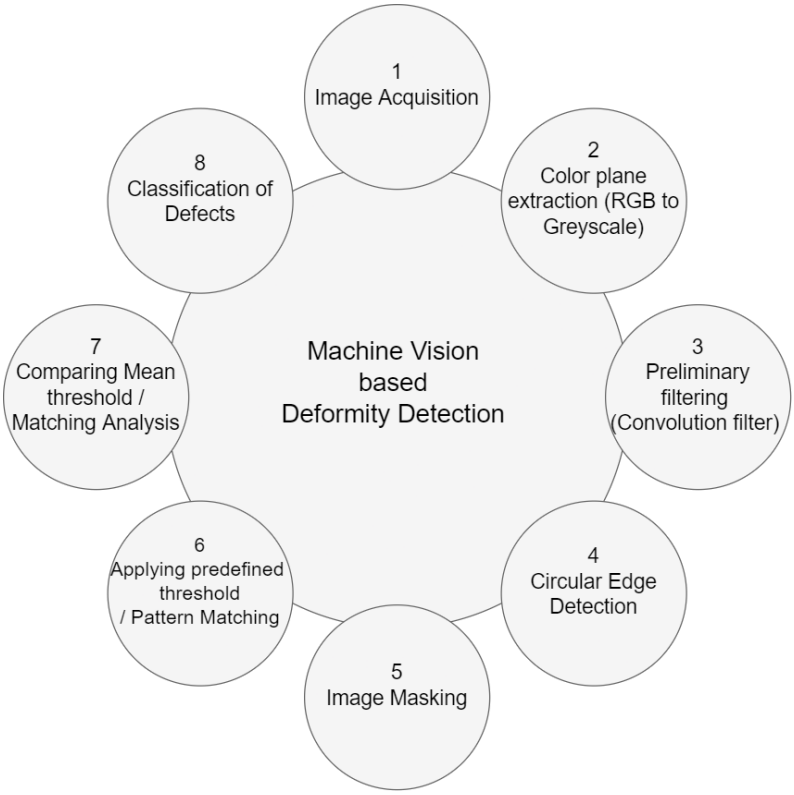
Installation/Integration - To overcome environmental lights interfering with product installation, we have used Cloud Diffusion Lighting (CDI) using Dome based structure.

Product Training - Minimal product training is required, since the number of variables presented to end user for modification is low. It's easily adaptable to the existing production line and works through 'plug and play' mechanism.

- To develop a special illumination system that distributes uniform illumination on the glossy metallic surface to reduce the reflection.
- To develop an image processing algorithm using NI's LabVIEW to identify and classify the defects based on a predetermined threshold limit.
- To develop a feeding and actuating system.

Our proposed system uses machine vision technology to perform dimensional analysis and identification of cracks and surface errors in automobile component manufacturing. Since our solutions processes manufactured products in batches, it is easily integrable to existing production lines in most of the industrial environments. Through our conveyor orientation mechanisms and magnetic flipping mechanism, multiple surfaces of the same product can be analyzed and segregated faster and at the same time matching the accuracy of the manual inspection. The system consists of the following subsystems

- Input Feeding System Illumination System
- Image Acquisition and Processing System
- Human Machine Interface (HMI) Actuation System



Our system is used effectively in the identification of cracks and 3-Dimensional topographical anomalies over a glossy metallic surface. For MUP development, an electronic horn contact pointer is taken as a use case. In an electronic horn contact pointer, there are two types of possible defects. One is an open crack defect and the other is a 3-Dimensional surface anomaly such as bends which won't be visible to the naked eyes. Fig 2.1 shows the electronic horn contact pointer.

Fig 1 - Electronic horn contact pointer

In fig 1, the circular part is the actual contacting point and hence the defects will happen only on the circular pointer. Being a glossy metallic surface, whenever light is illuminated on the surface, there will be a reflection and hence it will be difficult to capture the image without reflection. To overcome this constraint, we developed two special illumination systems namely Cloud Day Illumination (CDI) and Running zebra pattern Illumination. CDI will be effectively used to detect the surface cracks upto 0.1mm in width and the running zebra pattern illumination system is used to detect 3- Dimensional defects. Fig 2 and fig.3 shows the effectiveness of CDI on the same contact pointer.

Fig 2 without CDI

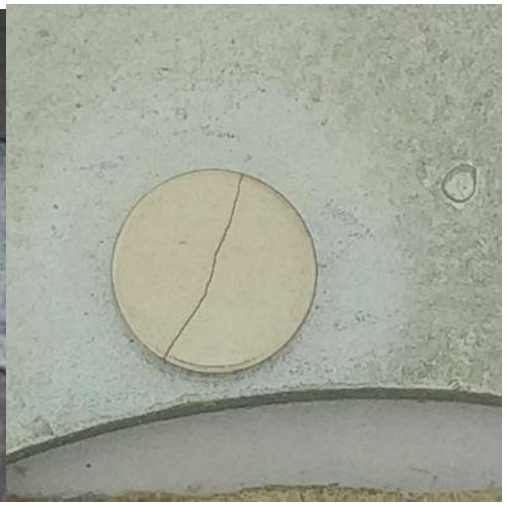


Fig 3 with CDI

From the above images, CDI is clearly visualized. By the uniform illumination provided by the CDI, the crack of width 0.2mm is captured without any reflection. Thus by using CDI, the reflective nature of the glossy metallic surface could be eliminated. Other than open cracks, there is possibility of 3-Dimensional surface topographical anomalies happening over the glossy metallic surface. These 3-D defects can't be seen with a naked eye. Hence a Running Zebra Pattern Illumination system is developed to overcome this constraint. Fig 4 and fig 5 shows the zebra pattern on a good and defect contact pointer.

Fig 4 - Defect less contact pointer

Fig 5 - Defective contact pointer

The system has been successfully tested. The Human Machine Interface of the system is provided below for each test case. Fig 6 represents the HMI for crack detection using the CDI system.

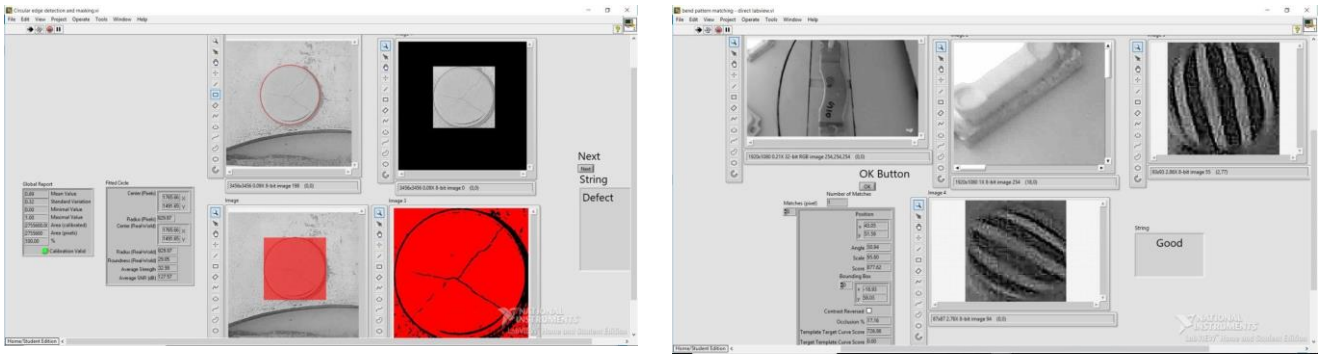


Fig 6 HMI for crack detection using the CDI system and 3- Dimensional surface anomaly detection

System demo at Roots Industries India Limited, Coimbatore

SMART NOZZLE CONTROL OF IRRIGATION PIPE [Crop Productivity Augmentation]

HARITHA K, 2016 -20 Batch

Agriculture plays a vital role in world economy. It is necessary to make economical utilization of resources as per the environmental conditions, to fulfill the fundamental needs of crops. Agriculture sector is the largest user of freshwater. But recent study says, demand for water in Municipal and Industrial will increase by 85%, this will cause high water stress in country. Therefore water management is an important option to cope with water scarcity. Thus to improve the crops in agricultural field and to manage water demand, irrigation process is implemented. And also we remember that field should neither be over-irrigated nor under-irrigated. The average normal field watering system has efficiency around 65-70%, while the irrigation has efficiency of around 90% thus it renowned for being a very efficient method of watering plants. We control the nozzle of the irrigation pipe automatically. This will make the irrigation system easy to use and increase the efficiency of crop productivity as well.

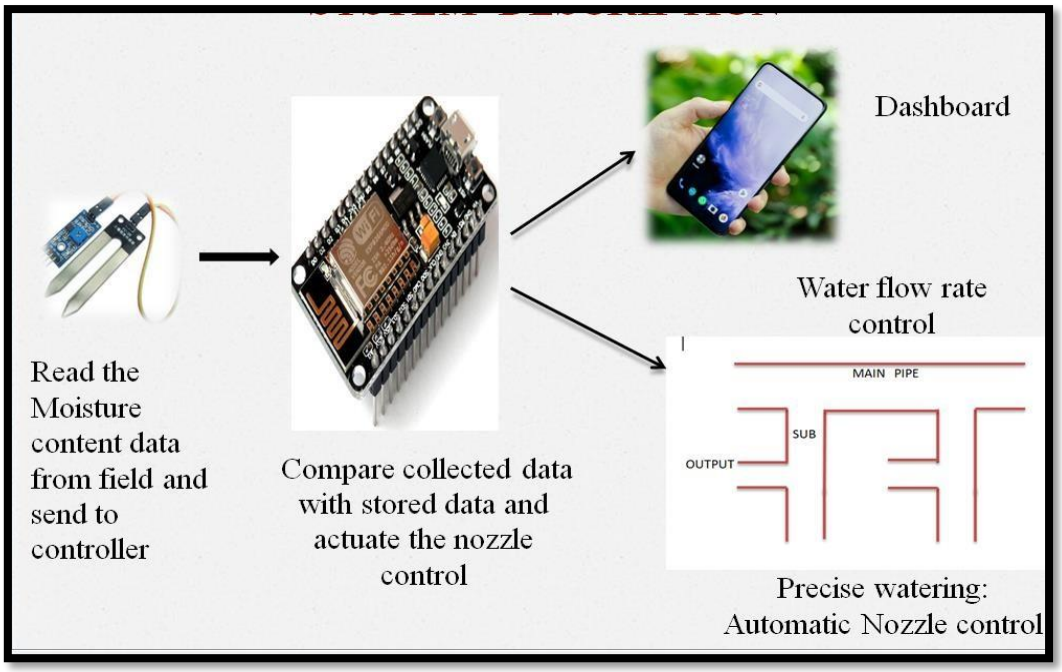
With increasing use of ground water, the water management has become the most important factor. Hence irrigation has introduced by researchers. In irrigation, stored water is permitted slowly to fall in drops either on surface of the soil or nearby of crop's root. It basically uses valves, emitters, and tubes/pipes. But the structure of irrigation valve is not designed for precise and smart irrigation scheduling.

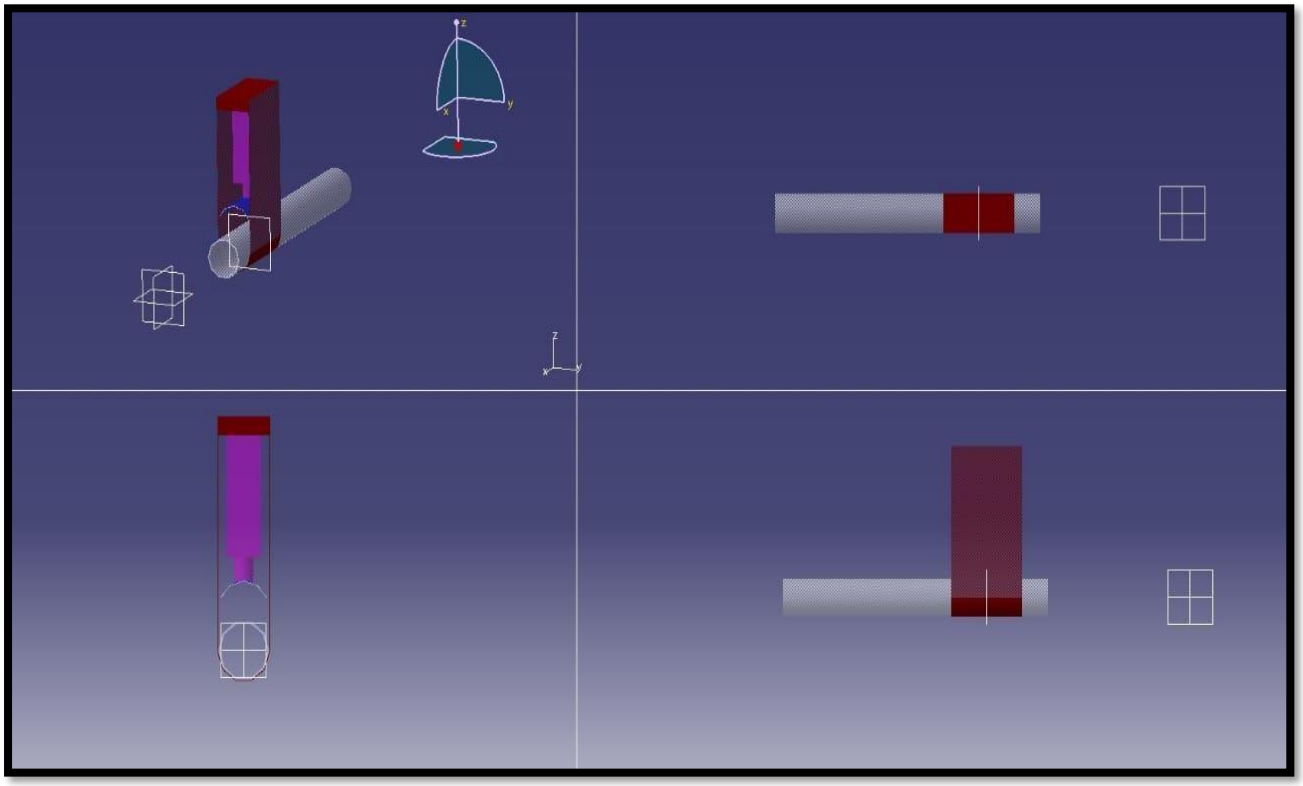
In this article, the nozzle of the irrigation pipe valve is automatically controlled based on the crop type, crop growing stage and moisture content of the agricultural field. This uses precise Irrigation scheduling by smart nozzle movement. Hence the crop yield/productivity and quality get improved. At present, there are different types of emitters available, but all these are categorized for specified flow rate. In order to vary the flow rate within the single installment in a smart and effective way, the smart nozzle is designed for circumstantial behavior.

OBJECTIVES:

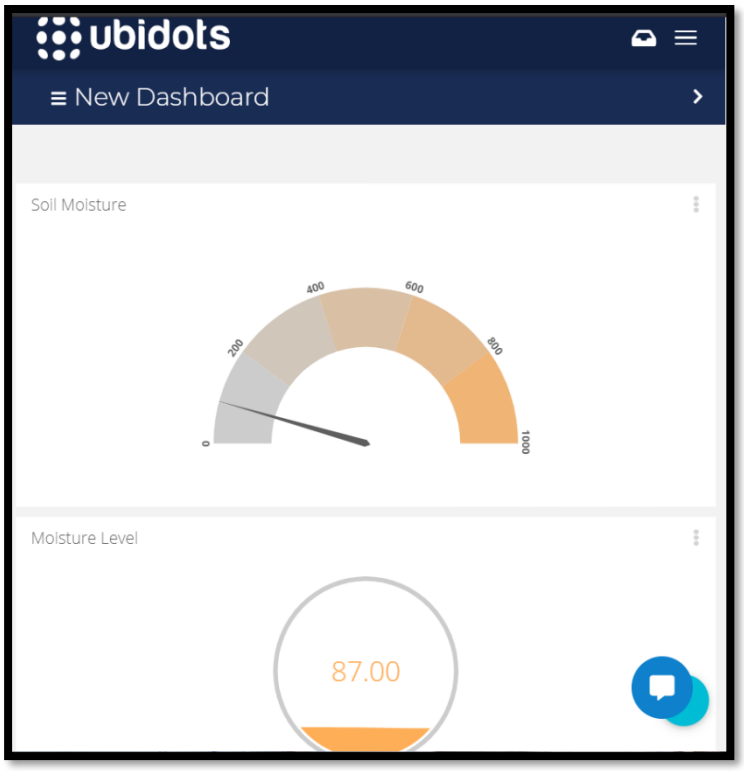
- To minimize the unnecessary water consumption in agricultural field by precise automatic nozzle control of drip pipe
- To avoid overwatering of crops, based on the data analytics based water flow control and to optimize the water usage based on field's moisture level
- To enhances the efficiency of plant and to increase the plant growth effectively which results in increase the crop productivity
- To use the smart nozzle for fertilizer usage in field crop in precise manner without using manpower

- To collect and store the data in the dashboard communication for future use and also provides easy for type of crop selection.

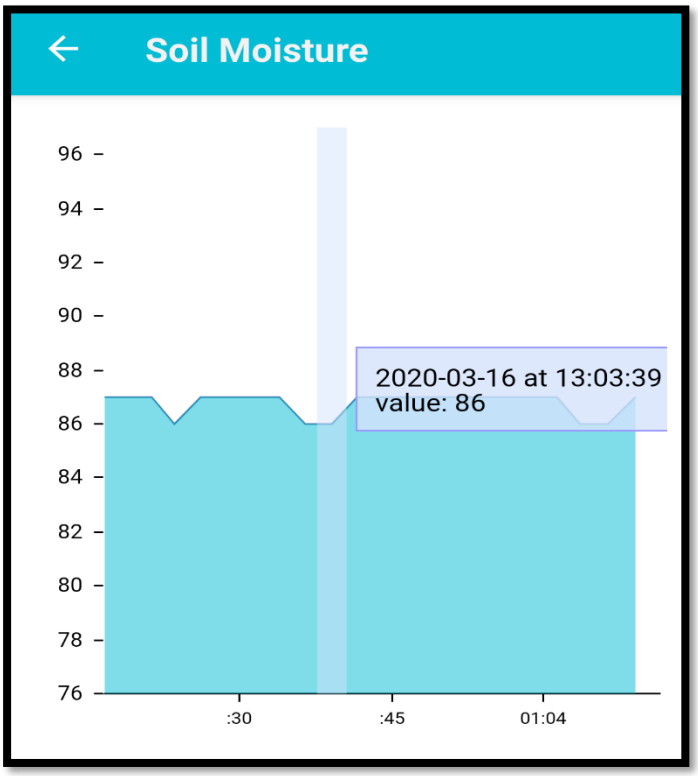




CAD View of Nozzle



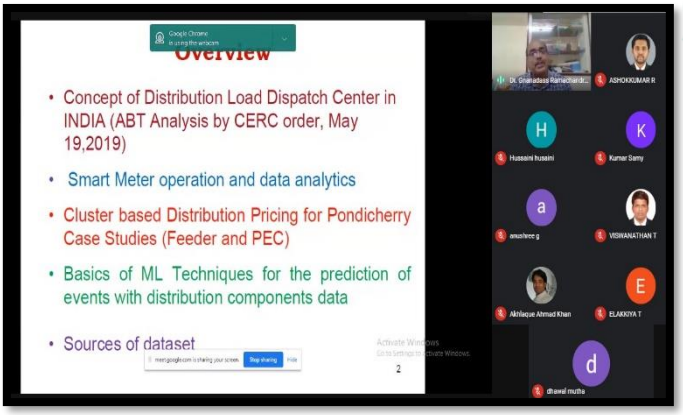
Dash Board Communication

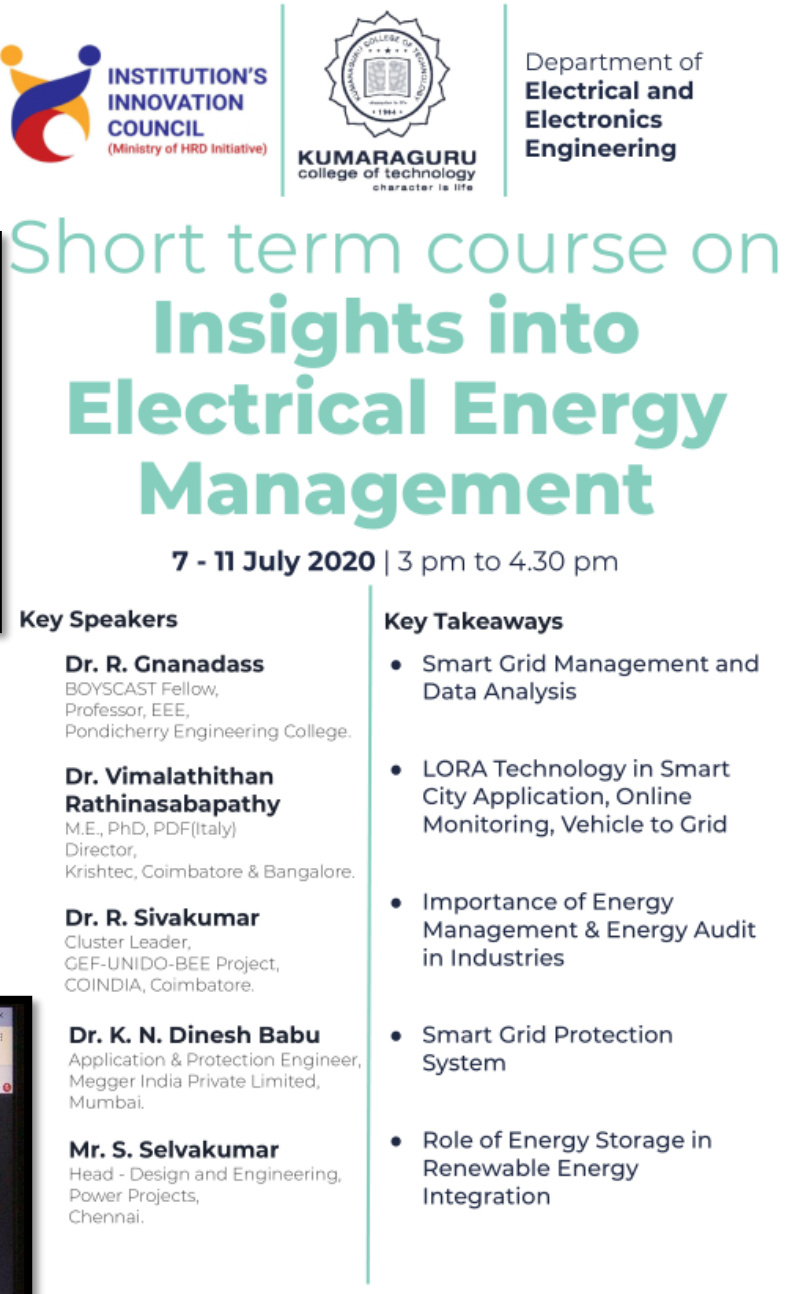


Application View

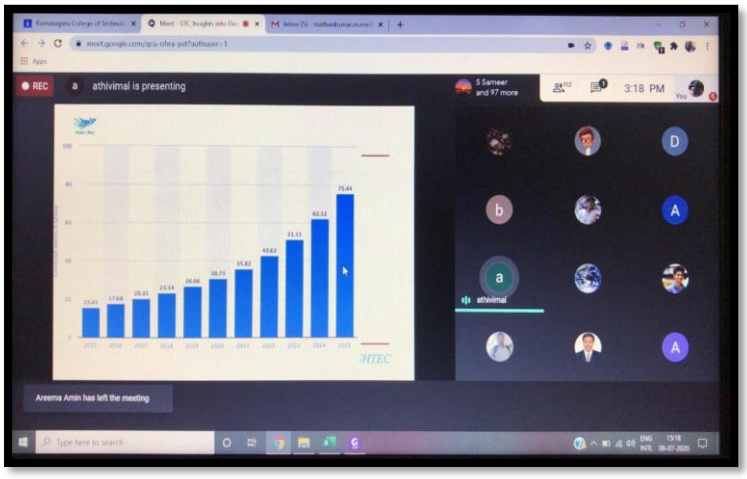
Short Term Training Program on Electrical Energy Management

The Short Term Training Program Course on, "Electrical Energy Management" has been organized for Faculty Members, Research Scholrs and PG Students from 7th – 11th July 2020 , through Online Mode, with a sum of 230 participants.





The course mainly focused on providing Smart Grid Management, LoRa Technology, Energy Audit Case Studeis and simple step for Home Energy Audit, Protection System, Integration of Renewable Energy.



Alumni Talk Series

A talk on Women Entrepreneurship: A Journey by Ms.Tharakeshwari of B.E EEE - 2001, Founder of Ganya Agro Products on 04-07-2020 at 11.00 AM

Online Skill Based Training to Students

AICTE Free Online Certification Course on **Learn To Design Solar Home System**

IN THIS LOCKDOWN, LEARN TO DESIGN SOLAR SYSTEM IN EASY STEPS

Don't miss this opportunity and become a Certified Energy Literate for free in 2-easy steps.

Steps to get Free Certificate

Instructions:

- This course is open for all college Students/Faculties.
- Any participant above the age of 14 years can take up this course.
- There are **15 videos** in the course. Students **need to watch each and every video** to successfully complete the course.
- Students must clear the quiz to get the certificate.

International Conference

International Web Conference on **Engineering, Science and Technology** (IWEST 2020)

Tuesday, **30 June 2020** | *9 am to 5 pm*
Online session Via **Google Meet**

About the Conference

The International Web Conference on Engineering, Science and Technology (IWEST 2020) is an interdisciplinary forum for technical discussions and cross-border learning. IWSET 2020 is a platform to UG/PG students, Faculties, Research Scholars and Industry People for the promotion of their original research.

Online Skill Based Training to Students

3 Day Online Workshop on **Signals and Systems using MATLAB**

29 - 31 July 2020 | 2 pm to 4 pm
Online Platform : Google Meet

MATLAB is a multi-paradigm numerical computing environment and proprietary programming language developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages.

In this 3-day online workshop, participants will master the implementation of this widely to express computational signals and systems**,** including **Time and frequency domain Analysis, Sampling theory and Filters.**

With the knowledge gained in this course, participants will be ready to undertake their knowledge about focuses on analysing, modifying, and synthesizing signals such as sound, images, and scientific measurements.

Covid'19 – KARE Social Impact

KUMARAGURU
college of technology
character is life

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PRESENTS

PROJECT LAB –

HARDWARE FACILITIES & MENTORING

FOR YOUR VALUABLE PROJECTS

The department of Electrical and Electronics Engineering provides hardware facilities for all kind of projects in the stream of EEE. The Students with project ideas in the stream of EEE can do their own projects using the hardware components available at project lab. They are also provided with guidance from leading Industrialist and alumni to clarify their projects doubts during development phase of his/her idea. This hardware lab can be used by UG & PG students to do their project which evokes their research skill in the field of EEE.

OBJECTIVE

To make the students to improve his/her project design and development skills for implementing their own ideas in real time.

PREREQUISITES

Basics of EEE, project idea with circuit diagram & knowledge of component specifications

ALL THE WORKING DAYS 4.30 PM TO 8 PM THROUGHOUT THE YEAR

FOR MORE DETAILS CONTACT

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Mr.C.Sasikumar 97860 37980