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Chalk Dust Collecting System

S. Mohith Sai Teja, IV-EIE

Model Description:

The chalk dust collector is composed of three individual parts. The first part of this system is the erasing part. This part consists of the duster arrangement used for cleaning the board. Next, the collection takes place. This part mainly consists of a vacuum motor used for collecting the chalk dust produced while erasing the board with the duster. The last part of this system is the sensing unit. The purpose of this unit is primarily to constantly monitor particle matter levels (PM2.5) in the classroom.

Principle of Operation:

Sensing Unit:

The sensing unit mainly works with the help of the SHARP GP2Y1010AU0F sensor. When the dust particles enter the sensor's hole, the chalk dust is converted into a voltage, its primary operating principle. This voltage is given as input to the Arduino. The output voltage is converted into the amount of chalk dust ($\mu g/m^3$) using the formula "(170 x output voltage) – 0.1". The converted voltage is displayed on the LCD unit.

Erasing and Collecting Unit:

The Arduino was programmed to change the duster's direction readily without changing the entire program code. The Arduino activates the motor drivers and the relay based on the bluetooth/push buttons command. The relay activates the vacuum motor for the sucking of chalk dust. The motor drivers then activate the DC motors based on the command from the Arduino with a delay of 50 milliseconds, thereby dusters also move in the specified direction. The direction of the movement of the duster is displayed with the help of an LCD unit. There are three directions used to move the duster. The first is the forward direction, the second is the reverse direction, and the third is the forward and reverse direction. As soon as the Arduino receives the command, it activates the start and stop-limit switches. The start and stops are decided based on the direction of movement of the duster. When the duster moves forward, the start limit switch gets activated, and the stop limit is already deactivated. As the duster reaches the stop limit switch, the motor driver gets deactivated, thereby stopping the movement of the duster. When the stop limit switch gets deactivated, the relay also gets deactivated, and the dust's suction also stops. The above operation applies the reverse direction, forward, and reverse direction

Block Diagram:

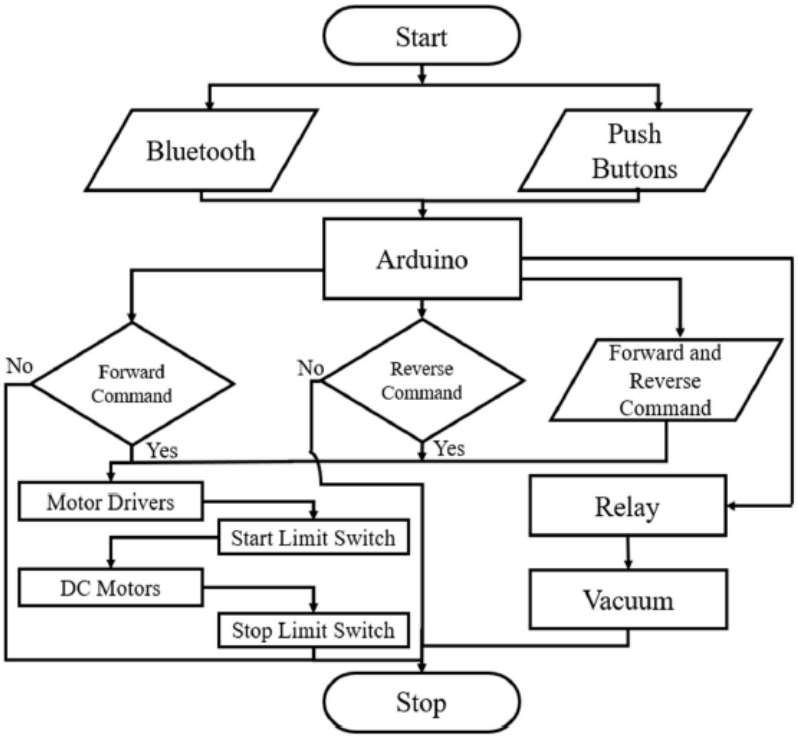


Fig: Flow diagram of erasing and collection section

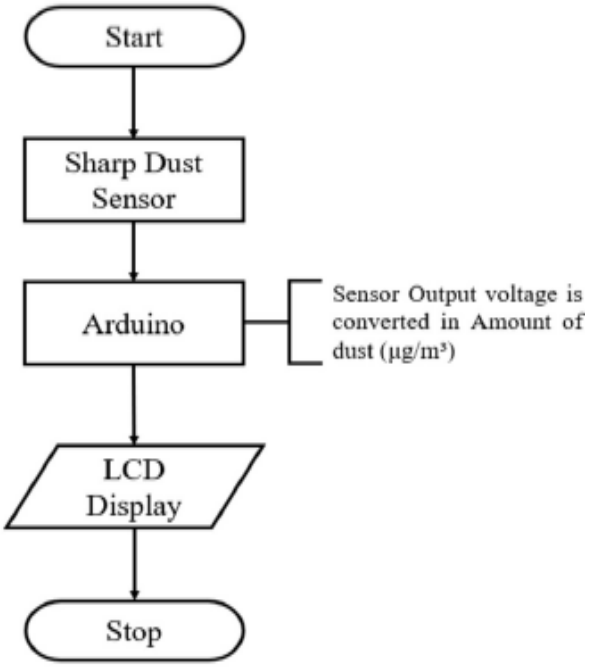


Fig. Flow diagram of sensing unit

Photograph of Proposed Model:

Fig. Chalk dust collecting system

Design of Sun Tracking Solar Panels with Improved Efficiency for Irrigation

D. Raja Swetha, IV-EIE

Introduction:

Of all the renewable energies, solar energy is the only energy gained its popularity and importance quickly. Through the solar tracking system, we can produce an abundant amount of energy which makes the solar panel's workability much more efficient. Perpendicular proportionality of the solar panel with the sun rays is the reason lying behind its efficiency. Its installation charge is high provided cheaper options are also available. This project is all about the design and construction mechanism of the prototype for the solar tracking system having a single axis of freedom.

Model Description:

Construction of the said project is being built out of the wooden base installed at the ground of it, affixed with the iron rods on both the sides in a cross-shaped manner connected with a hollow cylindrical rod from both the sides and the DC motor is clinging at one edge of the hollow rod. Three-fold sections into which the circuit of the solar tracking system is divided. The input stage has two LDR module that is so arranged to form a voltage divider circuit, the microcontroller is programmed through the software named Arduino ide being decked up in the system and lastly the driving circuit that has the DC motor helps in rotating the solar panel. The motor driver is embraced with three terminals- two for motor input/ output respectively and the third one for power input. The terminal for motor input is connected to 2 of the 14-digital input/output pins of Arduino UNO and subsequently, the motor output terminal is connected to the DC motor. The two LDR sensor modules are annexed to the scaffolding with NodeMcu analogue inputs. The light dependent resistors are then affixed along the length, on either side of the solar panel.

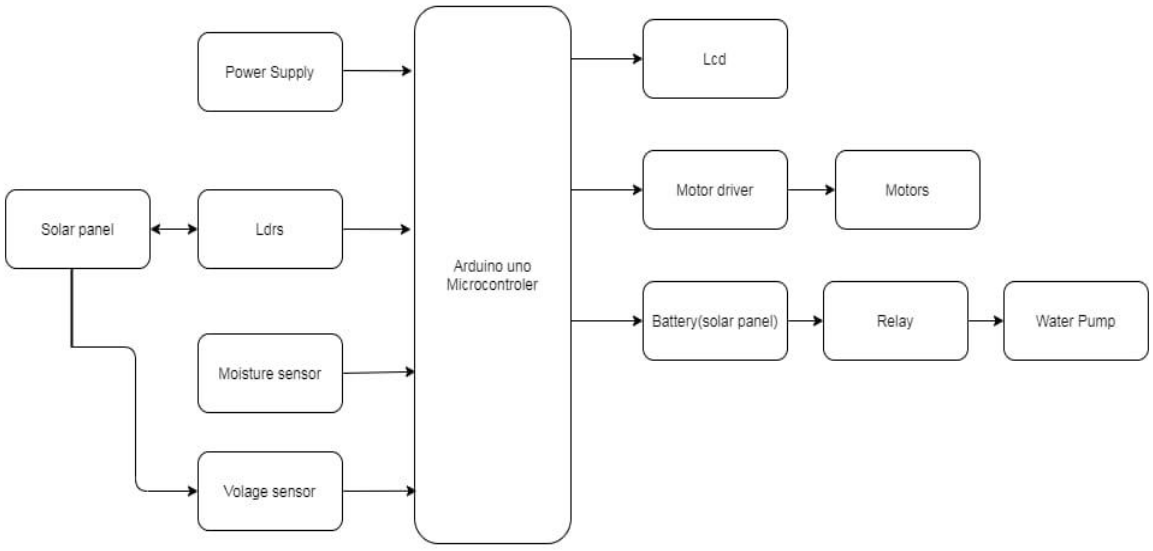


Figure: Block Diagram of Automatic Solar Tracking System

Working principle:

The main control circuit is based upon Arduino microcontroller. Programming of this device is done in the manner that the LDR sensor, in accordance with the detection of the sun rays, will provide direction to the DC Motor that in which way the solar panel is going to revolve. Through this, the solar panel is positioned in such a manner that the maximum amount of sun rays could be received. In comparison with the other motors, DC motor is the simplest and the suave one, the torque of which is high and speed of which is slow enough. We can program it for changing the direction notwithstanding the fact that it rotates only in one direction subject to exception as far as programming is concerned.

PROTOTYPE MODEL:

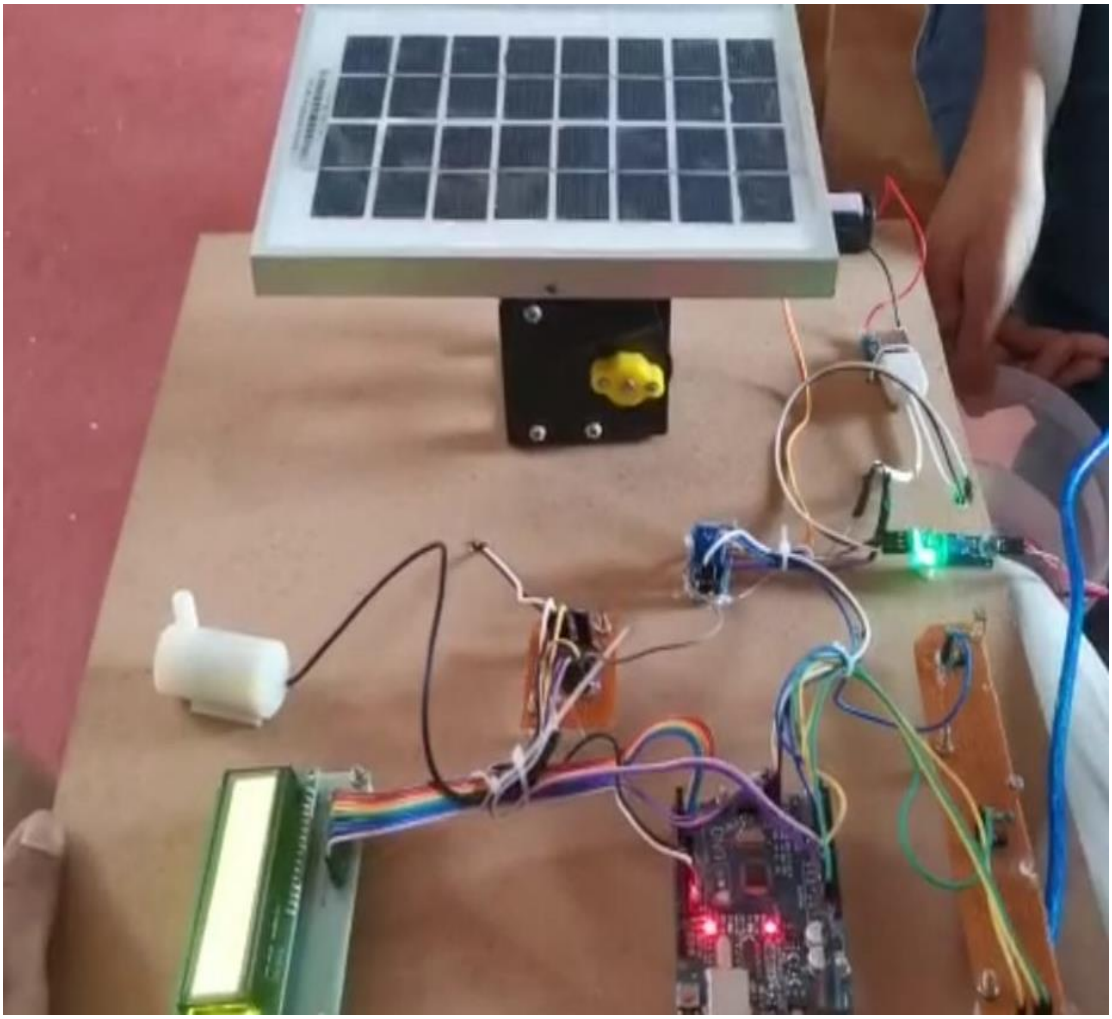


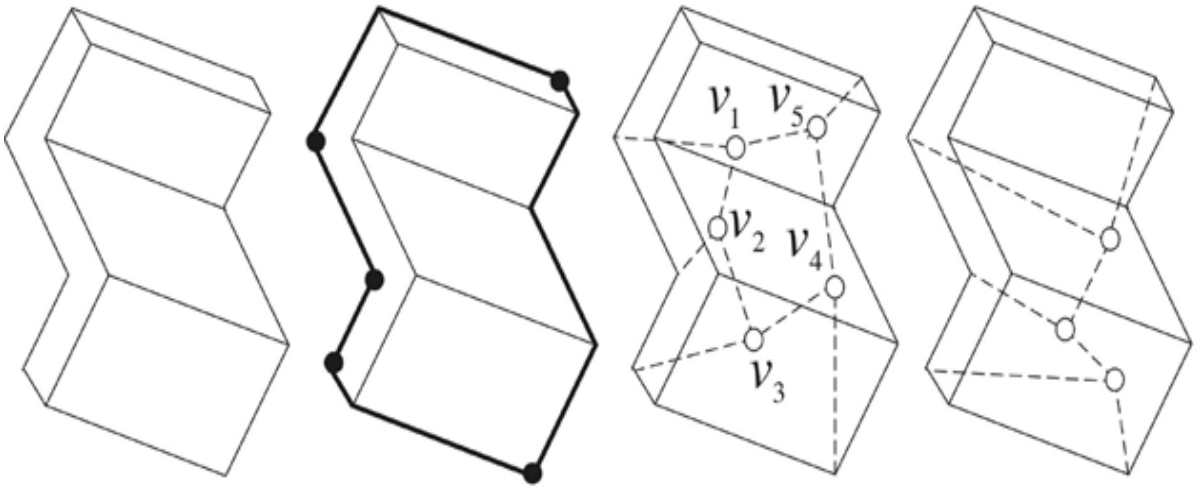
Figure: Complete setup of automatic solar tracking system

3- D Reconstruction

K Karthik Murthy, III- EIE

The human vision system can interpret a single 2D line drawing as a 3D object without much difficulty even if the hidden lines of the object are invisible. Though there reconstruction method of 3D CAD model could be done based on multiple views, here we will reconstruct a 3- D from only one view. This paper proposes an approach to reconstructing a complete 3- D object, including the shape of the rear side of the object, from a line drawing without hidden lines. First, we develop the theoretical constraints and an algorithm for the inference of the invisible edges and vertices of an object. Then, we present a reconstruction method based on perceptual symmetry and planarity of the object.

Outline of the algorithm



Step 1: Compute the degrees of all the vertices and the ranks of all the edges from the line drawing. An edge of a line drawing is the intersection of two non- coplanar planes. The degree of a vertex v is the number of edges meeting at v in a line drawing.

Step 2: Find boundary cycles and incomplete vertices. An incomplete vertex v is a vertex of degree 2 (for a 3- D object).

Step 3: Construct an initial hidden structure. Connect each incomplete vertex to a different hidden vertex. Two hidden vertices are connected if their corresponding incomplete vertices are closest on the boundary cycle.

Step 4: Reduce the initial hidden structure to the most possible one according to human visual perception of the 3D object, by using cutting and merging processes. Cutting one edge on a hidden cycle removes this edge from the cycle while keeping the two vertices of the edge. After the cutting, the two hidden vertices of the edge are connected by only two hidden edges.

All the possible hidden structures with least number of hidden vertices are found. Then the most possible structure is found using Gestalt laws of symmetry. Now from these inferences of hidden structures we reconstruct the object.

We need to derive the 3D coordinates of all the visible and hidden coordinates. We present an optimization- based method to recover the 3D shape of the complete object, for which we develop an objective function for this purpose. The function contains three components a measure of symmetry (measure of how closely the invisible part resembles the visible part), standard deviation of all angles from vertices based on Marill's approach, deviation from planarity. Based on the above analysis, the objective of reconstruction is to maximize symmetry while minimizing planarity deviation and standard deviation from all angles. The future work includes handling curved objects and more complex polyhedra.

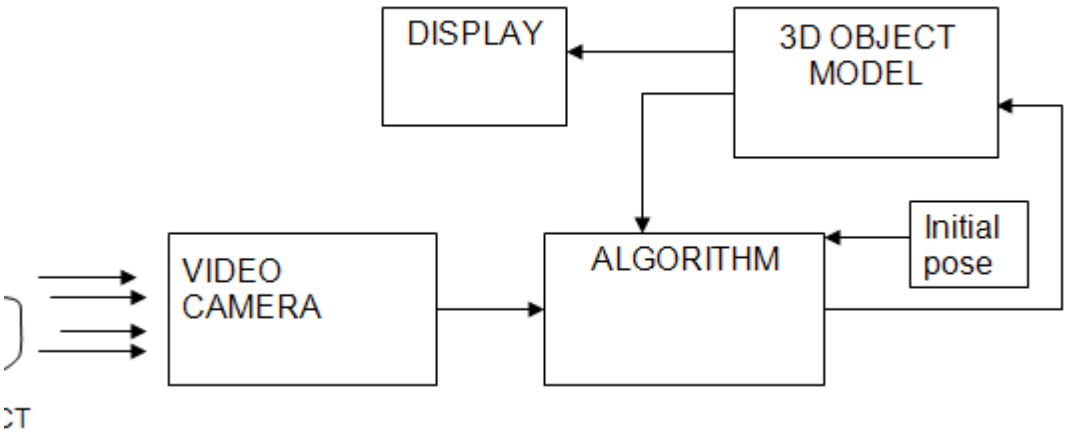
3D Tracking Technology

S K Mohinuddin, II- EIE

3D-tracking is the process of locating objects in 3D space based on their 2D images. It has a long tradition in computer vision research with many applications, such as robot navigation and human motion analysis. The essential inputs to a 3D tracking system are the video of the moving body to be tracked, and an object model for that body. Object model is a computer-generated model of the object to be tracked. A video consists of a series of still images. Each still image forms one frame. Movement of one object, through movement of the image, is got by running these frames at specified speed.

A general 3D tracking system

Block schematic of a general 3D tracking system is given in figure.



The video of the object to be tracked and its object model are fed to the algorithm. The algorithm then generates 2D to 3D point correspondences between the incoming frame and the object model.

These point correspondences are complex mathematical expressions and are found and processed with the help of computers. The point correspondences of the first frame must be established and given as input.

There are two classes of algorithms namely region-based technique and motion based technique.

Region based technique

In this technique, the object region is extracted through image segmentation process and is made to overlap with the corresponding 2D surface got by projection of the object model. The technique attempts to minimize the overlap error

Motion based technique

Two approaches are being adopted in this, mainly the optical flow approach and the scale invariant feature transform (SIFT) approach.

Optical flow approach

Here again, the approach is based on comparison- comparison of the optical flows got from the images and the object model. Optical flow is the pattern of motion of the object. This pattern is got based on specific features like edges, in visual scene. Optical flow field is derived making use of successive frames. Attempt is to get the optimal field. This method is very much sensitive to brightness changes and is restricted to small pixel displacements.

SIFT (Scale Invariant Feature Transform)

Scale-invariant feature transform (or SIFT) is an algorithm in computer vision used to detect and describe local features in images. The SIFT method involves the following steps:

- Key features in the frame are found. Key features include sharp changes in brightness, colour, intensity etc.
- Feature points lying outside the object model are removed.
- Remaining points are used for comparison between successive frames to obtain 2D-3D correspondences.

Very recently an object tracking technique has been introduced which combines all the above techniques. All three concepts are chosen such that the shortcomings of each one are compensated to a great extent by the others. Tracking by the object region can prevent the accumulation of errors. Optical flow and SIFT can handle larger transformations. Whereas segmentation works best in the case of homogeneous objects, optical flow computation and SIFT tracking, rely on sufficiently structured objects. A sensible combination yields a general tracking system that can be applied in a large variety of scenarios without the need to manually adjust weighting parameters.

There is a confidence measure estimated for the information from each technique. More the confidence measure more the weightage given to the information from that technique. From the correspondences found, the motion of the object model is estimated using the pose estimation minimization problem.

Reference:

Thomas Brox, Bodo Rosenhahn, Juergen Gall,Daniel Cremers, “Combined Region and Motion Based 3D Tracking of Rigid and Articulated Objects ,” IEEE Trans. Pattern Analysis and Machine Intelligence vol. 32,No.3,pp 402-415,March 2018.

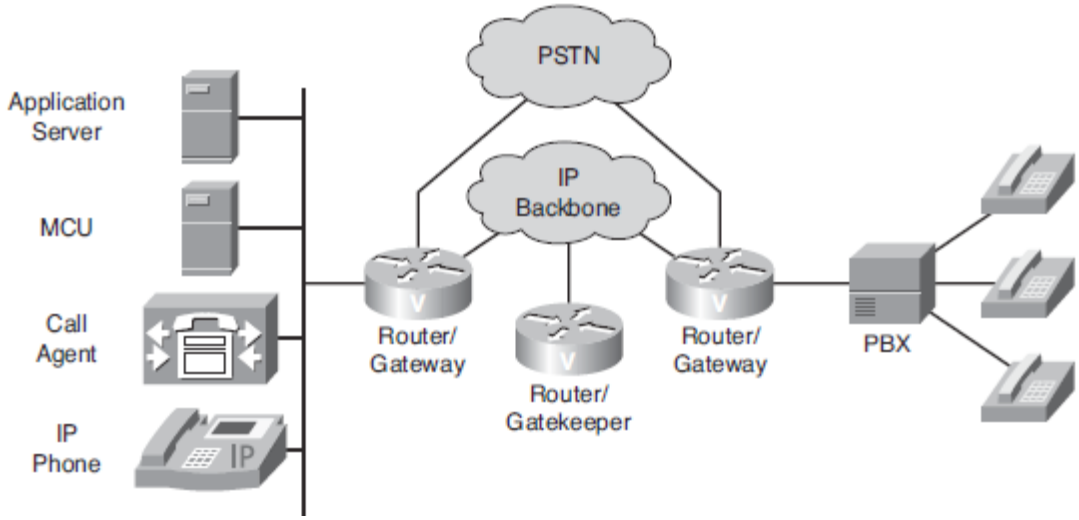
VoIP

P AKHIL SAI, II- EIE

Voice over IP is also known as VoIP. You might also hear VoIP referred to as IP Telephony. Both terms refer to sending voice across an IP network. However, the primary distinction depends on the endpoints in use. For example, in a VoIP network, traditional analog or digital circuits connect into an IP network, typically through some sort of gateway. However, an IP telephony environment contains endpoints that natively communicate using IP.

VoIP routes voice conversations over IP-based networks, including the Internet. VoIP has made it possible for businesses to realize cost savings by utilizing their existing IP network to carry voice and data, especially where businesses have underutilized network capacity that can carry VoIP at no additional cost.

Components of a VoIP Network



■ **IP Phones:** IP Phones provide IP endpoints for voice communication.

■ **Gatekeeper:** A gatekeeper provides Call Admission Control (CAC), bandwidth control and management, and address translation.

■ **Gateway:** The gateway provides translation between VoIP and non-VoIP networks, such as the PSTN. Gateways also provide physical access for local analog and digital voice devices, such as telephones, fax machines, key sets, and private branch exchanges (PBX).

■ **Multipoint Control Unit (MCU):** An MCU provides real-time connectivity for participants in multiple locations to attend the same videoconference or meeting.

■ **Call agent:** A call agent provides call control for IP phones, CAC, bandwidth control and management, and address translation. A call agent typically runs on a server platform. Cisco Unified Communications Manager is an example of a call agent.

■ **Application servers:** Application servers provide services such as voice mail, unified messaging, and Cisco Communications Manager Attendant Console.

■**Videoconference station:** A videoconference station provides access for end-user participation in videoconferencing. The videoconference station contains a video capture device for video input and a microphone for audio input. A user can view video streams and hear audio that originates at a remote user station.

■ **PBX:** A PBX (Private Branch Exchange) is a small telephone switch owned by a company or organization. These organizations purchase PBX's to reduce the total number of telephone lines they need to lease from the telephone company. Without PBX, a company will need to lease one telephone line for every employee with a telephone.

IP Networking and Audio Clarity

Voice over IP (VoIP) introduces additional challenges into a network design. Some of these challenges stem from the necessity of providing a perceptible level of voice quality to end users, while efficiently using available bandwidth.

Because of the nature of IP networking, voice packets sent via IP are subject to certain transmission problems. Conditions present in the network might introduce problems such as echo, jitter, or delay and packet loss. These problems must be addressed with quality of service (QoS) mechanisms.

■ **Echo:** Echo is a result of electrical impedance mismatches in the transmission path. Echo is always present, even in traditional telephony networks, but at a level that cannot be detected by the human ear. The two components that affect echo are (1) amplitude (loudness of the echo) and (2) delay (the time between the spoken voice and the echoed sound).

■ **Jitter:** Jitter is variation in the arrival of coded speech packets at the far end of a VoIP network. The varying arrival time of the packets can cause gaps in the recreation and playback of the voice signal. These gaps are undesirable and annoying to the listener.

■ **Delay:** Delay is the time between the spoken voice and the arrival of the electronically delivered voice at the far end. Delay results from multiple factors, including distance (propagation delay), coding, compression, serialization, and buffers.

■ **Packet Loss:** Voice packets might be dropped under various conditions such as an unstable network, network congestion, or too much variable delay in the network. Lost voice packets are not recoverable, resulting in gaps in the conversation that are perceptible to the user.

VIRTUAL USER INTERFACE

P Supraja, II- EIE

VUI is to bring an awareness on building a low cost virtual interface for interactive environments. This can be used to have an advanced educational experience, improve the quality and effectiveness of education by using computer. It develops a low cost virtual interface using hardware devices namely, a Raspberry pi with an IR camera and an IR pointing device such as light pen. The concept of VUI aims to be a major step towards the development of smart classroom and interactive conference halls.

The ease of presentation and user interaction will make a significant change in the field of education, finance and other day to day activities. The main goal is to develop a low cost virtual interface, based on usually accessible hardware in our daily lives, i.e., a video projector, a Raspberry-Pi with an IR-cam and an Infra-Red (IR)pointing device. The electronic white board is implemented using a layered approach.

Primarily a base layer for the board is created with suitable background color. Each stroke on the board is represented by a layer class. Further each stroke in the board is stacked as different layers with properties like color, brush size etc. The functions intended to be provided by the application are Virtual touch interface in which the users can perform operations such as left click, right click on the projected surface from the projector. Freehand drawing by using the pointing device. Different brush sizes and colors will be provided to the user. Learning process can be made much better by importing images and figures into the canvas. Notes and drawings can be recorded and later be distributed or used for future sessions. VUI aims to improve the traditional techniques and redefine the current scenario of presentation aiding tools. The notes and slides recording is one of the main advantage of VUI as it allows teacher and student to reuse or distribute later. While working as presentation aid, VUI enables the user to control the host computer as if the host computer screen is made to be a virtual touch screen.

LiFi (Light Fidelity)

T Siva Sree, II- EIE

INTRODUCTION

LiFi is transmission of data through illumination by taking the fiber out of fiber optics by sending data through a LED light bulb that varies in intensity faster than the human eye can follow. Very simply, if the LED is on, you transmit a digital 1, if it's off you transmit a 0, They can be switched on and off very quickly, which gives nice opportunities for transmitted data. "It is possible to encode data in the light by varying the rate at which the LEDs flicker on and off to give different strings of 1s and 0s.

WORKING TECHNOLOGY

What we require at all are some LEDs and a controller that code data into those LEDs. We have to just vary the rate at which the LED's flicker depending upon the data we want to encode. Further enhancements can be made in this method, like using an array of LEDs for parallel data transmission, or using mixtures of red, green and blue LEDs to alter the light's frequency with each frequency encoding a different data channel. Such advancements promise a theoretical speed of 10 Gbps. Radio waves are replaced by light waves in a new method of data transmission which is being called Li-Fi. Light-emitting diodes can be switched on and off faster than the human eye can detect causing the light source to appear to be on continuously. A data rate of greater than 100 Mbps is possible by using high speed LEDs with appropriate multiplexing techniques

COMPARISON BETWEEN LIFI AND WIFI

LiFi vs WiFi

S. No.	Parameters	Wireless Technologies	
		Light Fidelity	Wireless Fidelity
1.	Speed for data transfer	Faster transfer speed (>1 Gbps)	Data Transfer speed (150 Mbps)
2.	Medium through which data transfers occurs	Used Light as a carrier	Used Radio spectrum
3.	Spectrum Range	Visible light spectrum has 10,000 time broad spectrum in comparison to radio frequency	Radio frequency spectrum range is less than visible light spectrum
4.	Cost	Cheaper than Wi-Fi because free band doesn't need license and it uses light.	Expensive in comparison to Li-Fi because its uses radio spectrum.
5.	Network topology	Point to point	Point to point
6.	Operating frequency	Hundreds of Tera Hz	2.4 GHz

HOW IS IT DIFFERENT?

Li-Fi technology is based on LEDs for the transfer of data. The transfer of the data can be with the help of all kinds of light, no matter the part of the spectrum that they belong. That is, the light can belong to the invisible, ultraviolet or the visible part of the spectrum. Also, the speed of the internet is incredibly high and you can download movies, games, music etc in just a few minutes with the help of this technology. Also, the technology removes limitations that have been put on the user by the Wi-Fi.

APPLICATION OF LI-FI

Airlines

Airline Wi-Fi. Nothing says captive audience like having to pay for the "service" of dial-up speed Wi-Fi on the plane. passengers will "soon" be offered a "high-speed like" connection on some airlines. United is planning on speeds as high as 9.8 Mbps per plane.

Smarter Power Plants

Wi-Fi and many other radiation types are bad for sensitive areas. Like those surrounding power plants. But power plants need fast, interconnected data systems to monitor things like demand, grid integrity and (in nuclear plants) core temperature. The savings from proper monitoring at a single power plant can add up to hundreds of thousands of dollars. Li-Fi could offer safe, abundant connectivity for all areas of these sensitive locations. Not only would this save money related to currently implemented solutions, but the draw on a power plant’s own reserves could be lessened.

USES

LiFi can be used in the places where it is difficult to lay the optical fiber like hospitals. In operation theatre LiFi can be used for modern medical instruments. In traffic signals LiFi can be used which will communicate with the LED lights of the cars and accident numbers can be decreased. Thousand and millions of street lamps can be transferred to LiFi lamps to transfer data. In aircraft LiFi can be used for data transmission. It can be used in petroleum or chemical plants where other transmission or frequencies could be hazardous.

Eye Controlled Wheelchair using LabVIEW

J Priyanka, I- EIE

A powered wheelchair is a mobility-aided device for persons with moderate or severe physical disabilities. In order to take care for different disabilities, various kinds of interfaces have been developed for powered wheelchair control: such as joystick control, head control, etc. Though there are many methods available in recent times to enable their motility, they require efficient and precise control which is most of the times not possible.

Most of the mobility aided device are interfaced with keyboard, mouse, and the other computer input devices. These computers input devices cannot be operated by handicap persons. In this paper, a computer input device by human eyes only is proposed for handicap person. The existing computer input devices can be divided into five categories:

1. Bio-potential based method which utilizes body potential from the user by using special instrument. Instrument such as Electrooculography (EOG), Electromyography (EMG), and Electroencephalograph (EEG), Search coil can be used for measuring bio-potential.

The search coil output can be used as sources of computer input for handicap person.

2. Voice Based method, which use user's voice as source input. Voice analyzer is used to analyze user's voice and convert into digital data. The major defect of this system is that it gets easily affected by noise

3. Motion based method, utilizes other normal movement organs to operate computer input. Head, foot, and etc. can be used to control computer input. One of the key essentials of the proposed system is detecting and tracking the eye movements. A spectacle mounted camera will track the eye movement and control the wheelchair. The most challenging aspects will lie in finding a good way to differentiate iris and pupil locations, determining the eye‘s movement, and controlling the wheelchair‘s wheels in proper movement.

This model is mainly aimed at the quadriplegic patient who is completely paralyzed but have good eye coordination. In this project an IR camera is used to take the image of the eye which is then processed in LabVIEW to track the intended motion of the wheelchair. A commercially available web camera is head mounted on the user and it will track the eye movement of the user, actuating the wheelchair to go forward, stop, left or right.

A computer or laptop mounted on the electric chair processes the captured image data, compare it with the real time image of eye and track the movements of the user’s eyes using LabVIEW. An Arduino board is used to interface LabVIEW to the electric wheelchair. DC motors along with a motor driver is used to apply torque to the individual wheels so that direction control can be ensured.

This model helps the completely paralyzed person to have command over the wheelchair and its direction. An ultrasonic sensor and alarm can be incorporated into the powered wheelchair to detect obstacles in the path of the user and warn the user by ringing an alarm.to help the user to move in environments with ramps and doorways of little space an accelerometer can also be used to determine the inclination.

This project enables the disabled patients to move their wheelchair on their own without the help of any other person. However, the only drawback with this project is as the wheelchair requires eye-ball movement as input to the controller for its working, a lot of strain is created to the eyes

FUZZY LOGIC

V SRAVYA, II- EIE

Fuzzy Logic has been gaining increasing acceptance during the past few years. There are over two thousand commercially available products using Fuzzy Logic. Fuzzy logic is a powerful problem-solving methodology with a lot of applications in embedded control and information processing.

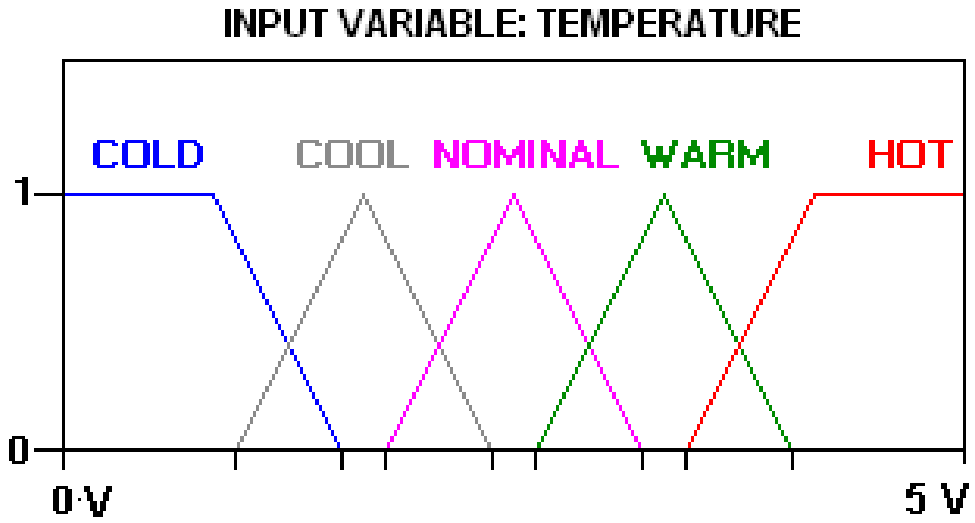
Fuzzy provides a remarkably simple way to draw definite conclusions from vague, ambiguous or imprecise information. In a sense, fuzzy logic resembles human decision making with its ability to work from approximate data and find precise solutions. Thus, it is very much associated with artificial intelligence.

Unlike classical logic, which requires a deep understanding of a system, exact equations, and precise numeric values, Fuzzy logic incorporates an alternative way of thinking, which allows modeling complex systems using a higher level of abstraction originating from our knowledge and experience.

Fuzzy Logic allows expressing this knowledge with subjective concepts such as very hot, bright red, and a long time, which are mapped into exact numeric ranges.

A fuzzy logic controller consists of an input stage, a processing stage, and an output stage. The input stage maps sensor or other inputs like switches to the appropriate membership functions and truth-values. Let us have a look at a simple fan speed controller. Say the temperature sensor output varies between 1 to 5v.

This range is divided into say, six different linguistic variables, too cold, very cold, cold, hot, very hot, too hot etc. These variables are very subjective and are mapped to appropriate membership functions of any shape, like triangular, trapezoidal etc. The shape is generally less important than the number of curves and their placement

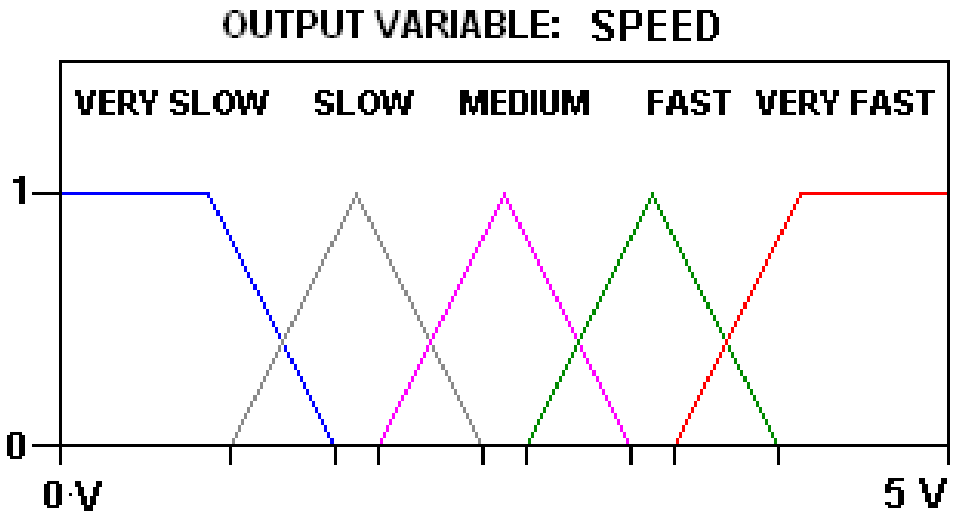


The processing stage is based on a collection of logic rules in the form of IF-THEN statements, where the IF part is called the “antecedent” and the THEN part is called the “consequent” For example, IF the temperature is WARM THEN fan speed is VERY FAST

The processing stage invokes each appropriate rule and generates a result for each, then combines the results of the rules based on a neuro-fuzzy system. Neuro-fuzzy system is a combination of artificial intelligence and fuzzy logic. The strength of neuro-fuzzy systems is characterized by two contradictory requirements in fuzzy modeling: interpretability versus accuracy.

In practice, one of the two properties prevails. The neuro-fuzzy in fuzzy modeling research field is divided into two areas: linguistic fuzzy modeling that is focused on interpretability, mainly the Mamdani model; and precise fuzzy modeling that is focused on accuracy, mainly the Takagi-Sugeno-Kang (TSK) model. Here we are dealing with Mamdani model.

The output stage converts the combined result back into a specific control output value by defuzzification. There are many methods for defuzzification like centriod method, height method etc.



Thus the controller output becomes 0V to 5V which can be interfaced with the fan to control the speed.

Many consumer goods incorporate fuzzy systems. Matsushita vacuum cleaners use micro controllers running fuzzy algorithms to interrogate dust sensors and adjust suction power accordingly. Canon developed an auto-focusing camera that uses a charge-coupled device (CCD) to measure the clarity of the image in six regions of its field of view and use the information provided to determine if the image is in focus.

What makes consumer electronics companies to go for fuzzy based system? Fuzzy Logic reduces the design development cycle by simplifying the design complexity. Thus improves time to marke.

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