ELECTRONICS AND INSTRUMENTATION ENGINEERS ASSOCIATION

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INSTRONICS

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WIRELESS GAUGE READER

ABB'S FLOWMETER

VALVE MANIFOLD

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"Our life is what our thought makes of it
Great thought comes from the heart"

We thank Our Honorable Management and Beloved Principal ***Dr.M.Madheswaran*** *for his valuable guidance and encouragement in bringing up this magazine* ***"INSTRONICS"*** *successfully.*

- ***EIE ASSOCIATION***

HOW TO BECOME A SUCCESSFUL INVENTOR:

How does an inventor turn their new invention ideas into money? Some often hope that they can sell their brilliant new idea to somebody who will hand them money. Sorry, it just does not work that way and you often end up handing a fistful of money in the other direction. The best answer is "get educated in how the whole process works"

Finding Great Ideas

How to start and keep the creative juices flowing and create great inventions. How to decide which of your ideas are worth pursuing. Improve Your Ability to Brainstorm. Invention Idea Survey. Why You Might Want to Get Your Invention Idea Assessed.

Business Start Up

If you have decided to establish a business to manufacture or sell your own invention, you will need a business plan to raise money or/and help your new business flourish.

How to succeed at selling and marketing your inventions

The most fundamental piece of advice I would give a newbie trying to sell his/her invention is this; conduct yourself in an appropriate businesslike manner.

Making a Prototype

An outline of the basics of making a prototypes - why make a prototype. By definition a prototype is a full-size working model of your invention suitable for use in the complete evaluation of form, design, performance, and material processing.

Keeping an Inventor's Logbook/Journal

Detailed records of the concepts, test results, and other information related to making an invention should be kept in a logbook. You can start a logbook from the very first moment you think of an idea.

How to Register and Use Trademarks Correctly

Trademarks protect words, names, symbols, sounds, or colors that distinguish goods and services. A great trademark can help with the sales of goods and services and very desirable goods or services can make a trademark famous. Naming an invention involves developing at least two names. One name is the generic name.

Searches & Indices - Finding Already Existing Trademarks

Step to step guides to searching for patents online using the inventor's name, keywords, or patent numbers. Step to step guides to searching for trademarks online; one purpose of a trademark search is to determine if someone has already trademarked your intended mark.

How to Register and Use Copyrights Correctly

A copyright protects the form of expression of a creator against copying. Literary, dramatic, musical and artistic works are included within

the protection of Indian copyright law. Copyright protection is given to the authors of "original works of authorship," including literary, dramatic, musical, artistic, and certain other intellectual works. This protection is available for both published and unpublished works.

Promotion Firms

Think you have a great idea for a new product or service? You're not alone. Every year, tens of thousands of people try to develop their ideas and commercially market them. Some people try to sell their idea or invention to a manufacturer that would market it and pay royalties.

But finding a company to do that can be overwhelming. As an alternative, others use the services of an invention or patent promotion firm. Many inventors pay thousands of dollars to firms that promise to evaluate, develop, patent, and market inventions, and then do little or nothing for their fees.

Trade Secrets

Trade secrets are information that companies keep secret to give them an advantage over their competitors. Trade secrets unprotected by a patent, copyright, or trademark as no public disclosure has been made.

TOP WAYS TO FAIL AS AN INVENTOR

Fail to Record Your Inventing Progress

Detailed records of the concepts, test results, and other information related to making an invention should be kept in a logbook. You can start a logbook from the very first moment you think of an idea. Proper record keeping can be used as proof of the conception date of an invention.

Getting Too Attached to Your Invention

It's good to believe in yourself and have determination, however, keep your grip on reality. Before selling your house to heavily invest in your invention do what is called an invention marketability assessment to help you estimate your product's chances of success.

Already Been Invented

You don't want to end up infringing on somebody else's intellectual property rights. Conduct what is called a search for prior art. That means checking to see if anybody else has already patented an invention similar or identical to yours.

Revealing Your Invention Too Soon

As soon as you reveal your invention to the public or anybody that has not signed a confidentiality agreement with you a one year countdown begins. Now you only have one year to patent your invention if you want to do so.

By:

Mr.D.Naresh,
Final Year (MEIEA).

TERMS OF PLC

AC/DC I/O Interface:

A discrete interface that converts alternating current (AC).voltages from field devices into direct current (DC) signals that the processor can use. It can also convert DC signals into proportional AC voltages.

Action:

A set of control instructions prompting a PLC to perform a certain control function during the execution of a sequential function chart step.

Acyclic message:

An unscheduled message transmission.

Addressability:

The total number of devices that can be connected to a network.

Address field:

The sequence of eight (or any multiple of eight) bits immediately following the opening flag sequence of a frame, which identifies the secondary station that is sending the frame.

American National Standards Institute (ANSI):

A clearinghouse and coordinating agency for voluntary standards in the United States.

American Wire Gauge (AWG):

A standard system used to designate the size of electrical conductors.

Application:

A machine or process monitored and controlled by a PLC. The use of computer or processor-based routines for specific purposes.

Artificial Intelligence (AI):

A subfield of computer science dealing with the development of computer programs that solve tasks requiring extensive knowledge.

ASCII I/O Interface:

A special function interface that transmits alphanumeric data between peripheral equipment and a PLC.

Back Plane:

A printed circuit board, located in the back of a chassis, that contains a data bus, power bus, and mating connectors for modules that will be inserted into the chassis.

Backup:

A device or system that is kept on hand to replace a device or system that fails.

Backward Chaining:

A method of finding the causes of an outcome by analyzing its consequents to obtain its antecedents.

Baseband Coaxial Cable:

A communication medium that can send one transmission signal at a time at its original frequency.

Basic Module:

An intelligent I/O interface capable of performing computational tasks without affecting the PLC processor's computing time.

Battery Backup:

A battery or set of batteries that will provide power to the processor's memory in the event of a power outage.

Baye's Theorem:

An equation that defines the probability of one event occurring based on the fact that another event has already occurred.

Bit-Wide Bus Network:

An I/O bus network that interfaces with discrete devices that transmit less than 8 bits of data at a time.

Blackboard Architecture:

The distribution of knowledge inferencing, as well as global and knowledge databases, in a control system through the use of several subsystems containing local, global, and knowledge databases that work independently of each other.

Block Check Character (BCC):

A character, placed at the end of a data block, that corresponds to the characteristics of the block.

Boolean Language:

A PLC programming language, based primarily on the Boolean logic operators, that implements all of the functions of the basic ladder diagram instruction set.

Bourdon Tube:

A pressure transducer available in spiral, helical, twisted, and C-tube configurations that converts pressure measurements into displacement.

Breadth-First Search:

A method of rule evaluation that evaluates each rule in the same level of a decision tree before proceeding downward.

Bridge Circuit:

A mechanism found in transducer circuits that uses resistors to change the parameters of an incoming signal.

Bus Topology:

A network configuration in which all stations are connected in parallel with the communication medium and all stations can receive information from any other station on the network.

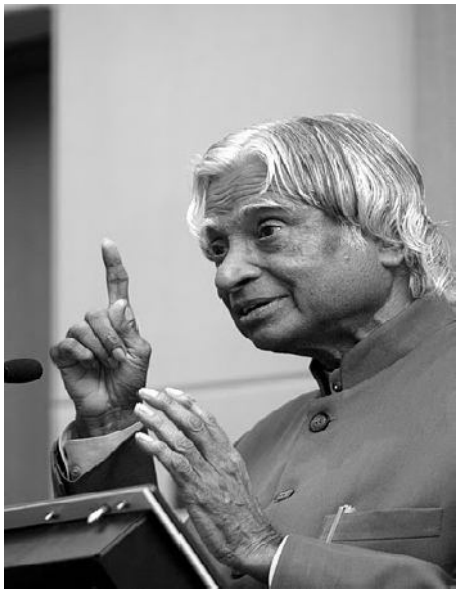
Bypass/Control Station:

A device that allows a process to be switched to either PLC or manual control.

By:

Ms.P.Priyanga,
Pre-Final Year(MEIEA).

A. P. J. ABDUL KALAM



Born: 15 October 1931
Profession: Aerospace engineering

Abdul Kalam is an Aerospace engineer, professor, and chancellor of the Indian Institute of Space Science and Technology (IIST), who served as the 11th President of India from 2002 to 2007. During his term as President, he was popularly known as the *People's President*. He was awarded the Bharat Ratna, India's highest civilian honor in 1997.

Before his term as India's president, he worked as an aeronautical engineer with DRDO and ISRO. He is popularly known as the *Missile Man of India* for his work on development of ballistic missile and space rocket technology. Kalam played a pivotal organizational, technical and political role in India's Pokhran-II nuclear test in 1998, the first since the original nuclear test by India in 1974.

He is currently the chancellor of Indian Institute of Space Science and Technology, a professor at Anna University (Chennai), a visiting professor at Indian Institute of Management Ahmedabad, Indian Institute of Management Indore, and an adjunct/visiting faculty at many other academic and research institutions across India.

BALLISTIC MISSILE:

A ballistic missile is a missile that follows a sub-orbital ballistic flight path with the objective of delivering one or more warheads to a predetermined target. The missile is only guided during the relatively brief initial powered phase of flight and its course is subsequently governed by the laws of orbital mechanics and ballistics.

FLIGHT:

A ballistic missile trajectory consists of three parts: the powered flight portion, the free-flight portion which constitutes most of the flight time, and the re-entry phase where the missile re-enters the Earth's atmosphere.

Ballistic missiles can be launched from fixed sites or mobile launchers, including vehicles (transporter erector launchers, TELs), aircraft, ships and submarines. The powered flight portion can last from a few tens of seconds to several minutes and can consist of multiple rocket stages.

When in space and no more thrust is provided, the missile enters free-flight. In order to cover large distances, ballistic missiles are usually launched into a high sub-orbital spaceflight; for intercontinental missiles the highest altitude (apogee) reached during free-flight is about 1200 km.

The re-entry stage begins at an altitude where atmospheric drag plays a significant part in missile trajectory, and lasts until missile impact.

MISSILE TYPES:

Ballistic missiles can vary widely in range and use, and are often divided into categories based on range. Various schemes are used by different countries to categorize the ranges of ballistic missiles.

Tactical ballistic missile: Range between about 150 km and 300 km. Battlefield range ballistic missile (BRBM): Range less than 200 km. Theatre ballistic missile (TBM): Range between 300 km and 3,500 km. Short-range ballistic missile (SRBM): Range 1,000 km or less.

Medium-range ballistic missile (MRBM): Range between 1,000 km and 3,500 km. Intermediate-range ballistic missile (IRBM) or long-range ballistic missile (LRBM): Range between 3,500 km and 5,500 km.

Intercontinental ballistic missile (ICBM): Range greater than 5,500 km.Submarine-launched ballistic missile (SLBM): Launched from ballistic missile submarines (SSBNs), all current designs have intercontinental range.

Short- and medium-range missiles are often collectively referred to as theater or tactical ballistic missiles (TBMs). Long and medium-range ballistic missiles are generally designed to deliver nuclear weapons because their payload is too limited for conventional explosives to be cost-effective (though the U.S. may be evaluating the idea of a conventionally-armed ICBM for near-instant global air strike capability despite the high costs).The flight phases are like those for ICBMs, except with no exoatmospheric phase for missiles with ranges less than about 350 km.

"**Thinking should become your capital asset, no matter whatever ups and downs you come across in your life".**

"You have to dream before your dreams can come true".

"We are all born with a divine fire in us. Our efforts should be to give wings to this fire and fill the world with the glow of its goodness".

By:

Mr.N.Yuvaraj,
Pre-Final Year (MEIEA).

FOXCONN TECHNOLOGIES:

Guided by a belief that the electronics products would be an integral part of everyday life in every office and in every home, Terry Gou founded Hon Hai Precision Industry Company Ltd, the anchor company of Foxconn Technology Group in 1974 with US$7,500, a devotion in integrating expertise for mechanical and electrical parts and an uncommon concept to provide the lowest "total cost" solution to increase the affordability of electronics products for all mankind.

Foxconn Technology Group is the most dependable partner for joint-design, joint-development, manufacturing, and assembly and after-sales services to global Computer, Communication and Consumer-electronics ("3C") leaders. Aided by its legendary green manufacturing execution, uncompromising customer devotion and its award-winning proprietary business model, eCMMS, Foxconn has been the most trusted name in contract manufacturing services (including CEM, EMS, ODM and CMMS) in the world.

Focusing on fields of nanotechnology, heat transfer, wireless connectivity, material sciences, and green manufacturing process, besides from cooperating with the establishment of the research institution for nanotech, new material, and optical electric, Foxconn also sets up several research centers and testing laboratories for mechanism, material, electronics to conduct the services of science research and technology development worldwide.

Furthermore, Foxconn devotion to develop nanotech, thermal treatment, nano measure, wireless network, environmental protection, CAD/CAE, optical plating technique, precision/nano processing, SMT, and network CMOS chips, in terms, allows Foxconn to accumulate over 25,000 patents granted worldwide by 2010. This made Foxconn a recognized leader of innovation and technical know-how in rankings such as MIT's patent scorecard.

Aside from hardware related technology research and development investment, Foxconn also relentlessly seeks to provide customers ever fuller menu of end-to-end services to choose from. Logistic planning and e-supplying system adopted for the global supply chain management,computer software.

Development and computer programming, sales channel solutions are just some of the latest investment and involvement that have continued to gain appreciation from the worldwide customers.

Foxconn's commitment to continual education, investing in its people long term and localization globally not only leads to the deep collaborating relationships with leading institutions of higher learning, but also helps to make this Fortune Global 500 group's global operations including the largest exporter in Greater China and the second largest exporter in Czech Republic.

Today, Foxconn Technology Group is the most dependable partner for joint-design, joint- development, manufacturing, assembly and after-sales services to global Computer, Communication and Consumer-electronics ("3C") leaders. Aided by its

legendary green manufacturing execution, uncompromising customer devotion and its award-winning proprietary business model, eCMMS, Foxconn has been the most trusted name in contract manufacturing services (including CEM, EMS, ODM and CMMS) in the world.

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Aside from hardware related technology research and development investment, Foxconn also relentlessly seeks to provide customers ever fuller menu of end-to-end services to choose from. Logistic planning and e-supplying system adopted for the global supply chain management, computer software development and computer programming, sales channel solutions are just some of the latest investment and involvement that have continued to gain appreciation from the worldwide customers.

Competitive Advantages

Foxconn's competitive advantages stem from the award-winning eCMMS business model and an unique Foxconnian culture. By defining herself as a service company rather than a manufacturing concern, Foxconn defines company products as Speed, Quality, Engineering Services, Flexibility and Monetary Cost Saving. Foxconnians devote to customer's long term success and pride in our hardworking culture.

Foxconn's revolutionary eCMMS model:

eCMMS stands for e-enabled Components, Modules, Moves and Services.eCMMS is the vertical integrated one stop shopping business model by integrating mechanical, electrical and optical capabilities altogether. It covers solutions ranging from moulding, tooling, mechanical parts, components, modules, system assembly, design, manufacturing, maintenence, logistics ... etc. Through eCMMS model, Foxconn's Shenzhen campus is not only the world's largest 3C manufacturing base, but also the shortest supply chain at the same time. As the result, eCMMS is recognized as the best corporate strategy by AsiaMoney Magazine Poll (2002).

By:

Ms.A.Priyanga,
Final year (MEIEA).

ENERGY LEAK DETECTOR:

High sensitivity, portable temperature comparator.Detects draughts around doors, windows, etc.

Circuit diagram:

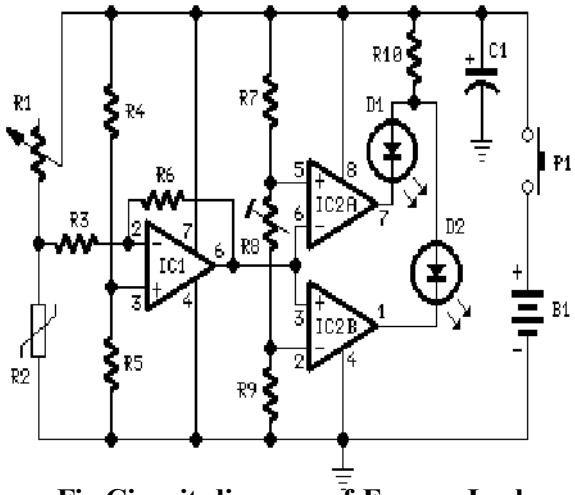


Fig.Circuit diagram of Energy Leak Detector.

Parts:

R1-22K Linear Potentiometer
R2-5K @ 20°C n.t.c. Thermistor
R3-10K 1/4W Resistor
R4,R5,R7,R9-22K 1/4W Resistors
R6-220K 1/4W Resistor
R8-5K 1/2W Trimmer Cermet
R10-680R 1/4W Resistor.
C1-47µF 63V Electrolytic Capacitor
D1-5mm. Red LED
D2-5mm. Green LED
IC1-TL061 Low current BIFET Op-Amp
IC2-LM393 Dual Voltage Comparator
IC P1-SPST Pushbutton
B1-9V PP3 Battery
Clip for PP3 Battery

Operations:

This sensitive circuit is basically a comparator, detecting very slight temperature changes in respect to the ambient temperature. It was primarily intended to detect draughts around doors and windows that cause energy leaks but can be used in many other ways, when a sensitive temperature change detector is needed.Two LEDs are used to signal if the temperature change is pointing above (Red LED) or below (Green LED) the ambient temperature.

Circuit operation:

IC1 acts as a bridge detector and amplifier: its output voltage raises when temperature increases and vice-versa. This happens because the n.t.c. resistor R2 reduces its resistance value as temperature increases and vice-versa, therefore unbalancing the bridge formed by R1, R2, R4,R5.IC2A and IC2B form a window comparator and R8 is the sensitivity control.

Before starting a measurement the circuit must be balanced by means of R1 in order to obtain that both LEDs are off. If R8 is set to zero resistance the circuit sensitivity will be at maximum and one of the LEDs will illuminate when a very slight difference in temperature will be detected. As R8 value is increased the circuit sensitivity will decrease.

Note:

The Thermistor value can be chosen in the 10K - 22K @ 20°C range.

R1 value should be about twice the Thermistor value @ 20°C, so using a 22K Thermistor a 47K potentiometer should be used.To ensure fast detection of temperature changes, the use of a Thermistor having the case as small as possible is recommended

BATTERY-POWERED NIGHT LAMP:

Ultra-low current drawing
1.5V battery supply

Circuit diagram:

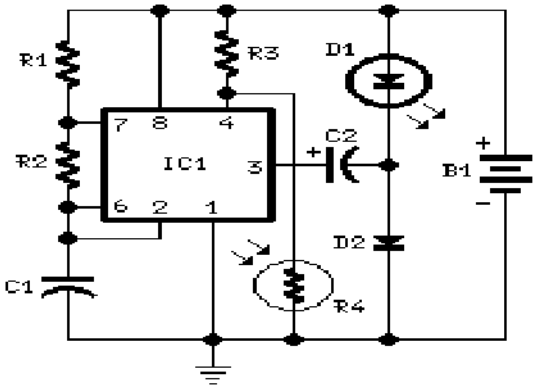


Fig.Circuit diagram of battery-powered night lamp

Parts:

R1,R2-1M 1/4W Resistors

R3-47K 1/4W Resistor

R4-Photo resistor

C1-100nF 63V Polyester Capacitor

C2-220µF 25V Electrolytic Capacitor

D1-LED Red 10mm. Ultra-bright

D2-1N5819 40V 1A Schottky-barrier Diode

IC1-7555 or TS555CN CMos Timer IC

B1-1.5V Battery (AA or AAA cell etc.)

Device purpose:

This circuit is usable as a Night Lamp when a wall mains socket is not available to plug-in an ever running small neon lamp device. In order to ensure minimum battery consumption, one 1.5V cell is used, and a simple voltage doubler drives a pulsating ultra-bright LED: current drawing is less than 500µA.An optional Photo resistor will switch-off the circuit in daylight or when room lamps illuminate, allowing further current economy.

This device will run for about 3 months continuously on an ordinary AA sized cell or for around 6 months on an alkaline type cell but, adding the Photo resistor circuitry, running time will be doubled or, very likely, triplicated.

Circuit operation:

IC1 generates a square wave at about 4Hz frequency. C2 & D2 form a voltage doubler, necessary to raise the battery voltage to a peak value able to drive the LED.

Notes:

IC1 must be a CMos type: only these devices can safely operate at 1.5V supply or less. If it not needing Photo resistor operation, omit R3 & R4 and connect pin 4 of IC1 to positive supply. Ordinary LEDs can be used, but light intensity will be poor.

An ordinary 1N4148 type diode can be used instead of the 1N5819 Schottky-barrier type diode, but LED intensity will be reduced due to the higher voltage drop. Any Schottky-barrier type diode can be used in place of the 1N5819, e.g. the BAT46, rated @ 100V 150mA.

NOCTURNAL ANIMALS WHISKER:

A low-rate flashing lamp drives away undesired visitors. Automatic on-off operation.

Circuit diagram:

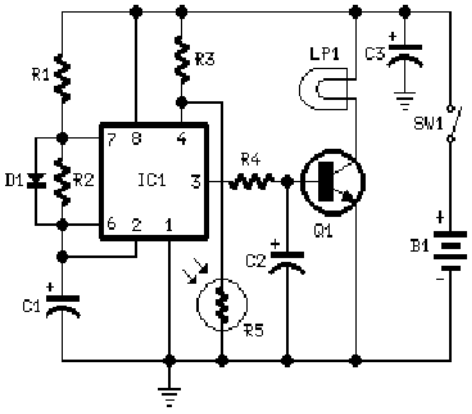


Fig.Circuit diagram of nocturnal animal whisker.

Parts:

R1-100K 1/4W Resistor
R2-2M2 1/4W Resistor
R3-10K 1/4W Resistor (see Notes)
R4-4K7 1/4W Resistor
R5-Photo resistor (any type, see Notes)

C1,C2,C3-47µF 25V Electrolytic Capacitors

D1-1N4148 75V 150mA Diode

IC1-7555 or TS555CN CMos Timer IC

Q1-BD681 100V 4A NPN Darlington Transistor

LP1-6V 3W Bulb (see Notes)

SW1-SPST Switch

B1-6V 1.2A Lead acid sealed rechargeable Battery (see Notes)

Device purpose:

This circuit has proved very useful in keeping away from a terrace or a porch some bats and other nocturnal animals. You can use it for similar or different purposes. The lamp illuminates for a 4-5 seconds delay and stays off about one minute and 15 seconds. The photo resistor allows automatic switch-on of the circuit at dusk and switch-off at dawn. Supposing an eight hours operation per night, the lamp stays on for a total of about 30 minutes, allowing great current economy.

Circuit operation:

IC1 is wired as an astable multivibrator with on and off time-delays as explained before. R1 & C1 set the on time-delay, R2 & C1 set the off time-delay. As there is no critical parameter, you can set these delays at your wish. Q1 is the lamp driver and can feed rather big bulbs. C2 prevents some brief instability when voltage at pin 4 of IC1 is very close to switching threshold.

Notes:

Mount the photo resistor's sensitive surface at an angle of 90 degrees or more compared with the lamp, in order to avoid light interaction.Owing to the photo resistor type or to suit your own special needs, R3 can be varied to set the operating threshold.If you are not needing automatic on-off operation, omit R3 & R5 and connect pin 4 of IC1 to positive supply.The bulb can be any 6V type up to 10-12W, but a 3W one is a very good compromise.Batteries can be of the rechargeable type: lead acid sealed, NI-CD, NI-MH packages ranging from 3.6 to 12V.

SELF-POWERED FAST BATTERY-TESTER:

Tests 1.5 to 15 Volt cells.Two-LED display, no power supply required.

Circuit diagram:

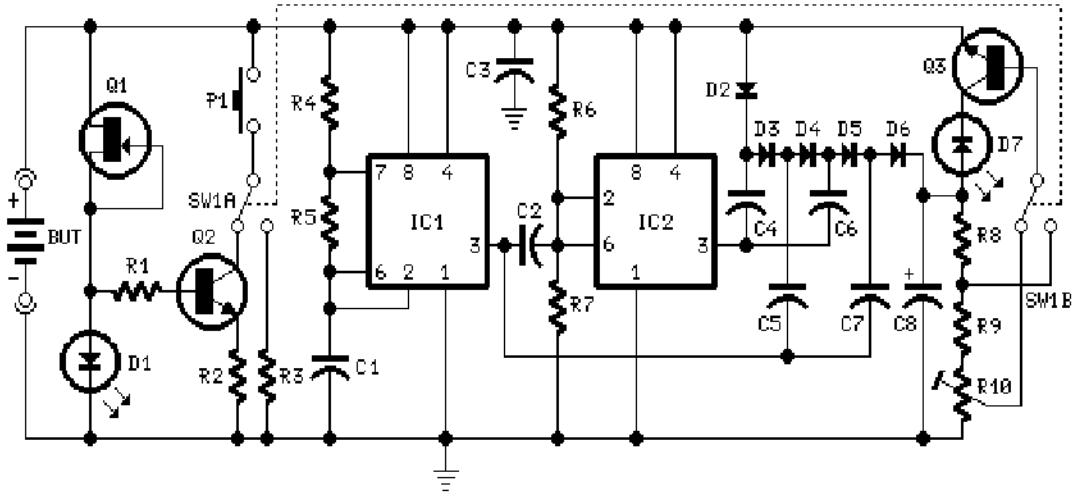


Fig. Circuit Diagram of Self-Powered Fast Battery-Tester.

Device purpose:

This circuit runs a fast battery test without the need of power supply or expensive moving-coil voltmeters. It features two ranges: when SW1 is set as shown in the circuit diagram, the device can test 3V to 15V batteries. When SW1 is switched to the other position, only 1.5V cells can be tested.

Circuit operation:

FET Q1 provides a constant current generator biasing LED D1 and Q2 Base. In this manner D1 illuminates at a constant intensity, independent of battery voltage from 3 to 15V and Q2 (when P1 is closed) applies a constant current loa0d of about 120mA to the battery. IC1 is a square wave generator oscillating at about 3KHz. IC2 acts as an inverter and drives, together with IC1 but in anti-phase, Diodes D2-D6 and Capacitors C4-C7, obtaining a voltage multiplication. C8 is charged by this raised voltage and R8-R10 form a voltage divider biasing the Base of Q3.

When P1 is open, a very light load is applied to the battery under test and If the battery is not fully charged, its output voltage starts reducing: when this voltage falls 0.6V below the battery nominal voltage, Q3 Emitter becomes more negative than the Base. The time spent by C8 to reduce its initial voltage to the new one, proportional to the voltage of the loaded battery. If the battery under test is in a good charging state, its output voltage will not fall under a 120mA loading current.

By:

Mr.A.Gokul Kumar,
Pre-Final Year(MEIEA).

WIRELESS GAUGE READER :

Fig.Wireless gauge reader.

OneWireless Gauge Reader non-invasively clips to the front face of existing gauges to enable remote monitoring of gauge readings. Installation takes minutes and does not require removing old gauges, breaking pressure seals, performing leak checks, running wires or interrupting the underlying process.

Adapters are available to fit most size and type of manual gauges for pressure, temperature, vacuum and other measurements.

Benefits:

The following are the benefits include such as,

Improved asset management and uptime.

- Energy savings.
- Energy audits.
- Better yield/quality.
- Safer and more efficient employees.

DL424PPM DISSOLVED OXYGEN TRANSMITTER:

DirectLine transmitter modules are the next generation family of analytical transmitters

Fig.DL424 Dissolved oxygen transmitter.

The transmitter is design for outside use in harsh environments where moisture, dust and chemical attack may be present. For submersion or special mounting applications, a remote mounting option is available which connects the electronics module to the DO probe via a cable.

The module can be mounted on a 2-inch pipe, wall or DIN rail.Signal output of the DirectLine transmitter is a standard(4-20)mA dc output proportional to dissolved Oxygen which may be connected to any host monitor or control device that accept(4-20)mA loop powered inputs.

FLOW MEASUREMENT:

ABB's knowledge about flow measurement and management is unmatched. Over the decades, ABB has developed an unrivalled understanding of customers' challenges and developed innovative solutions to meet them. You have access to over 100 years of flow measurement and control experience to help you save cost and increase profits.

Fig. Flowmeter.

ABB's flowmeter portfolio contains breakthrough product innovations designed to solve problems, increase profits and save costs.ABB provides for all your flow measurement, distribution and control needs.

Innovative range of products that is unsurpassed in the number of proven measurement techniques Enabling users to operate more efficiently, reduce costs, increase profitability while meeting the needs of even the most demanding applications Accurate and reliable gas measurement products that supply supplying a detailed audit trail for customers Advanced signal processing provides outstanding measurement performance with long-term stability Proven to be tough, reliable and incredibly easy to work with, saves resources at every stage of the lifecycle.

3 AND 5 VALVE MANIFOLDS:

With years of manifold design and development experience Parker Hannifin are able to offer the most comprehensive range of differential pressure transmitter manifolds available to users for a wide variety of applications and industries.

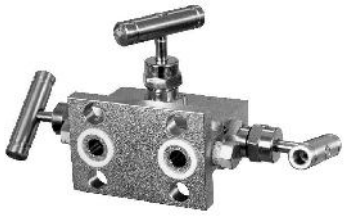


Fig. 3 valve manifold.

Fig. 5 valve manifold.

Three and five valve manifolds for direct or remote mounting.
Three and five valve manifold for model 3051 transmitter
Five valve custody transfer/fiscal metering manifold.

By:

Mr.C.S.Muraleedharan,
Second Year(MEIEA).

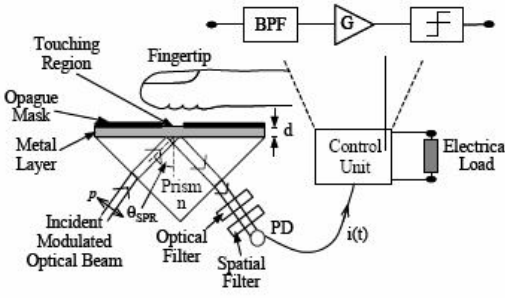
TACTILE SENSORS:

Tactile sensing is a field that is rapidly progressing and becoming more useful. One major use of tactile sensing is minimally invasive surgery. This technology will allow surgeons to make smaller incisions and use sensors to virtually feel and look at the internal organs of a patient.

A highly developed tactile sensor could even detect cancerous cells from healthy cells1. Tactile sensing can also be used in different interfaces with touchscreens. For example, the iPhone uses touch technology and Microsoft has introduced Microsoft Surface2, a multi-touch interactive table-top that uses a combination of different technologies, including infra-red sensors, to detect touch.

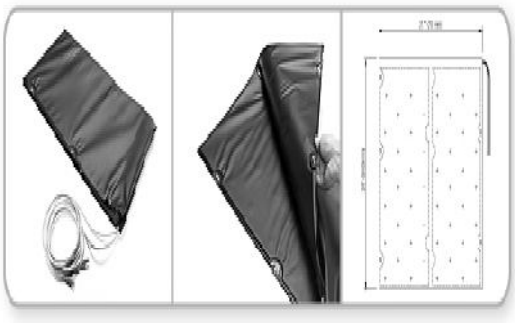
Similarly, hp's TouchSmart3 is using single-touch technology to change the way we use computers today. Eventually, touch technology could be used to develop prosthetics with touch feedback. The apple trackpad also uses touch technology to understand the different ways of touching the mousepad into different actions.

Interferometry:



Interferometry is a way to detect changes in the properties of light. It superpositions of two (or more) intersecting light beams and how they reflect off of a surface. When the surface is shifted, the differi ng beams of light give information on the light beam.Occasionally, only one light source is used and then broken up using partial mirrors or grating.

The Kinotex sensor from Tacte x uses its own modification of this technology. There are various taxels (receivers – the number depends on what size the array is) and at least two laser light sources. Each of the taxels pick up a different signal from the light sources. When pressure is applied, the signal received by each of the taxels changes, and the software that comes along with it interprets the results.



"Large Array Sensor" from Tactex using Kinotex technology.

The sensors are very thin, and the sensitivity can be changed depending on the resistor used in the circuit. Piezoresistive sensors are also quite inexpensive. Force sensing resistors, or FSRs, use the piezoresistive effect to determine pressure applied. Interlink Electronics is a company that is the biggest FSR manufacturer. FSRs respond to any stimuli, not just skin, and have been used in Microsoft game controllers.10 When a force is applied to the sensor, the resistance decreases. The Tactilus product is an incredibly user friendly sensor from Sensor Products11 Inc that

uses piezoresistive technology to create arrays of sensors for surface pressure mapping.

Tactilus products can only be purchased with the accompanying software, which includes extensive imaging, etc. The company can customize sensors to any specific needs, allowing the sensors to conform to difficult shapes. Tactilus free form are smaller piezoresistive sensors that can be run simultaneously, and give feedback in parallel.

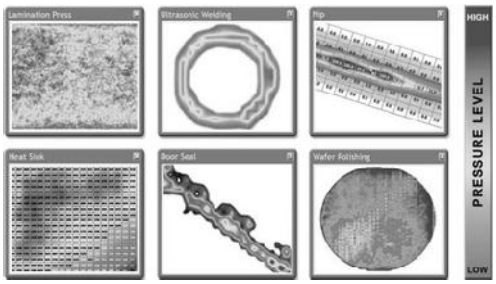
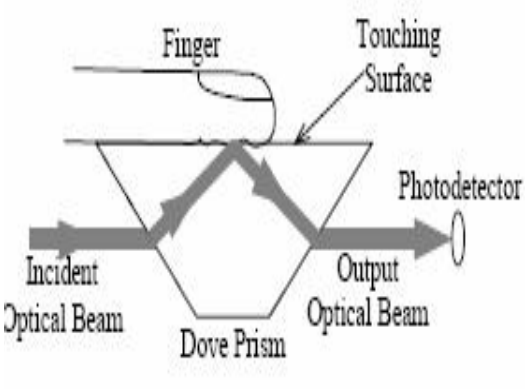


Fig. Pressure level of sensor.

Total internal reflection is a phenomenon that occurs when light travels from a more optically dense into a less optically dense medium. Because of refraction, the beam of light bends away from the norm (the path of light if it traveled in a straight line). At once point the angle of incidence becomes so great that the light bounces back into the denser medium.

At this point, the surface where the two mediums come into contact acts like a mirror, and reflects the light. When a force is exerted on this surface, the output beam bounces back at a different angle. The photodetector can detect what the percentage of light is striking, which helps it infer the angle at which the light is coming from.



Surface plasmon resonance occurs when surface plasmons interact with light, which increases their level of excitation. Surface plasmons are electromagnetic waves that occur parallel to the boundary layer between a metal and a dielectric material. When the surface is disturbed, so is the boundary layer, which in turn changes the direction surface plasmons.

Two polarized light beams of different frequencies are emitted and go on to excite the surface plasmons. The polarized light beams are reflected back at a different frequency. A detector receives both of these light beams, and can then deduce what the image of the surface was. Force sensors using this technology have notyet been made commercially available.

By:

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THE FOUR BIGGEST MISTAKES IN INSTRUMENTATION:

Despite ongoing advancements in measurement and communications technology, instrumenting a process for feedback control remains a technical challenge. Today's sensors are certainly more sophisticated than ever before, and field bus technology has simplified many installation issues considerably. Nonetheless, much can still go wrong with an instrumentation project.

Mistake #1:
Selecting the wrong sensor

Technology mismatch Although it's generally obvious what quantity needs to be measured in a flow, temperature, or pressure control application, it's not always obvious what kind of flow meter, temperature sensor, or pressure gauge is best suited to the job. A mismatch between the sensing technology and the material to be sensed can lead to skewed measurements and severely degraded control. This is especially true when measuring flow rates. All flow meters are designed to measure the rate at which a gas or liquid has been passing through a particular section of pipe, but not all flow meters can measure all flows.

A magnetic flow meter or magmeter, for example, can only detect the flow of electrically conductive materials by means of magnetic induction. Non-conductive fluids like pure water will pass through a magmeter undetected. Magmeters also have trouble distinguishing air bubbles from the fluid in the pipe. As a result, a magmeter will always yield an artificially high reading when bubbles pass through because it cannot sense the decrease in fluid volume caused by the presence of the bubbles. In a feedback loop, this occurrence would cause the controller to throttle back the flow rate more than necessary, preventing the required volume of fluid from reaching the downstream process. The problem gets even worse if the pipe is so full of air that it is only partially filled with liquid, a condition known as open channel.

Although recent technological innovations allow certain magmeters to work in such a challenging environment, mechanical sensors such as turbines yield artificially high readings, since a trickle of fluid will move the meter's mechanism just as much as a full-pipe flow traveling at the same speed. On the other hand, mechanical sensors are not affected by the conductivityof the fluid, so they will sometimes work where magmeters fail.

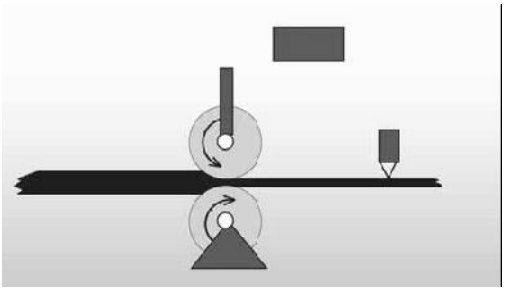

Fig. Poor Sensor Placement.

An even more challenging application is the measurement of pH in a caustic liquid such as the slurries found in paper mills. A general-purpose pH probe made of corrodible materials might not only generate inaccurate data, it might die altogether, sometimes within a matter of days. Some probes, such as those offered by ABB, are specifically designed for

such tough environments. They can double, triple, and even quadruple probe life in many applications. The trick is to find the right technology for the application, or to choose instruments that span a broader range of solutions. For example, new digital technologies allow some flow meters to solve many more flow problems than their predecessors.

Instrumentation vendors can be of help in avoiding the technology mismatch mistake. The best vendors train their sales people to assist with sensor selection and provide clients with easy-to-use selection guides. Some even offer extensive look-up tables based on product number, application, and serial numbers of past installations— an especially useful service when replacing older products. Finding all the right parts can also be a challenge. Some instruments require specific housings, mounting hardware, and transmitters to forward the sensor's data to the controller. The right vendor can make all the difference by providing the entire assembly under a single catalog number.

When it comes to temperature instrumentation, for example, training costs and purchasing effort are reduced when then vendor offers compatible probes and transmitters together as a package. Paying too much (or too little) Correct sensor selection is also a matter of balancing cost against performance. When there's a choice of equally effective technologies, the right choice is generally the cheapest one that gets the job done. Temperature instrumentation is a classic example. The two dominant technologies are resistance temperature detectors (RTDs) and thermocouples. An RTD consists of a metal plate or rod through which a current is passed. The resistance that the current encounters varies with the temperature of the metal. A thermocouple consists of two dissimilar metal wires joined together at one end. The voltage between the unjoined ends varies with the temperature of the joint.

Both yield voltages that can be electronically interpreted to indicate the temperature of the surroundings. Thermocouples are generally cheaper, though less accurate than RTDs. If the application does not require particularly tight temperature control, an inexpensive thermocouple and a well-tuned PID loop should do the trick. But for processes that will only work correctly at very specific temperatures, it would be a mistake not to pay for the greater accuracy that an RTD affords.

The cost of scrapping a batch of under-cooked or scorched products would eventually dwarf any savings in equipment costs. A fast sensor can also be worth the extra cost. If the process requires a rapid succession of heating and cooling cycles, the temperature sensor must be able to generate a reading before it's too late to be of any use. Despite their cheaper pedigree, thermocouples tend to respond faster than RTDs— so if speed is the only important performance issue, choose a thermocouple.

Continued…….

By:

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NEURAL NETWORKS IN MEDICINE:

Medicine has always benefited from the forefront of technology. Technology advances like computers, lasers, ultrasonic imaging, etc. have boosted medicine to extraordinary levels of achievement.

Artificial Neural Networks (ANN) is currently the next promising area of interest. It is believed that neural networks will have extensive application to biomedical problems in the next few years. Already, it has been successfully applied to various areas of medicine, such as diagnostic systems, biochemical analysis, image analysis, and drug development.

Diagnostic systems:

ANNs are extensively used in diagnostic systems. They are normally used to detect cancer and heart problems. The benefits of using ANNs is that they are not affected by factors such as fatigue, working conditions and emotional state.

Biochemical Analysis:

ANNs are used in a wide variety of analytical chemistry applications. In medicine, ANNs have been used to analyse blood and urine samples, track glucose levels in diabetics, determine ion levels in body fluids, and detect pathological conditions such as tuberculosis.

Image analysis:

ANNs are used in the analysis of medical images from a variety of imaging modalities. Applications in this area include tumour detection in ultra-sonograms, classification of chest x-rays, tissue and vessel classification in magnetic resonance images (MRI), determination of skeletal age from x-ray images, and determination of brain maturation.

Drug development:

ANNs are used as tools in the development of drugs for treating cancer and AIDS. ANNs are also used in the process of modelling biomolecules.

Modeling and Diagnosing the Cardiovascular System:

Neural Networks are used experimentally to model the human cardiovascular system. Diagnosis can be achieved by building a model of the cardiovascular system of an individual and comparing it with the real time physiological measurements taken from the patient.

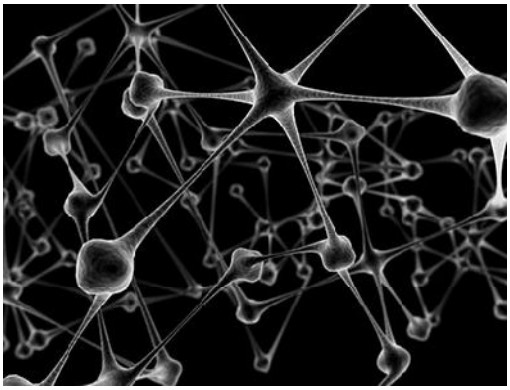
If this routine is carried out regularly, potential harmful medical conditions can be detected at an early stage and thus make the process of combating the disease much easier.

A model of an individual's cardiovascular system must mimic the relationship among physiological variables (i.e., heart rate, systolic and diastolic blood pressures, and breathing rate) at different physical activity levels.

If a model is adapted to an individual, then it becomes a model of the physical condition of that individual. The simulator will have to be able to adapt to the features of any individual without the supervision of an expert. This calls for a neural network.

Another reason that justifies the use of ANN technology, is the ability of ANNs to provide sensor fusion which is the combining of values from several different sensors.

In medical modelling and diagnosis, this implies that even though each sensor in a set may be sensitive only to a specific physiological variable, ANNs are capable of detecting complex medical conditions by fusing the data from the individual biomedical sensors.



This model could be used to monitor employees in hazardous environments like fire-fighters. The system could be used to determine whether firemen have recovered sufficiently from the last inhalations of smoke to be allowed to enter smoke-filled environments again.

The advantages that such a system can offer are obvious. People can be checked for heart diseases quickly and painlessly and thus detecting any disease at an early stage. Of course, the system doesn't eliminate the need for doctors since a human expert is more reliable.

Conclusion

ANNs have a lot to offer to modern medicine. At the moment they are mainly used for pattern recognition using images but experiments are being done in using ANNs to model parts of the human body. Neural networks will never replace human experts but they can help in screening and can be used by experts to double-check their diagnosis.

By:

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FUZZY LOGIC CONTROLLER

INTRODUCTION

In recent years, the fuzzy logic/set theory has been utilized for various control applications including motor control. The fuzzy logic has made the control of complex non linear systems with unknown or un-modeled dynamics as simple as possible. The application of DC motor in industrial environment has increased due to the high performance and high starting torque as suitable drive system. There have been several conventional control techniques in DC motor drives are presented. In earlier conventional control strategies were used and it comprises of fixed arrangement with fixed parameter design. Hence the tuning and optimization of these controllers is a challenging and difficult task, particularly, under varying load conditions, parameter changes, abnormal modes of operation.

Senthil Kumar et.al have demonstrated the separately excited dc motor fed by a chopper (DC to DC converter) and controlled by a fuzzy logic controller. It has been reported that the fuzzy logic controller controls the duty cycle of the chopper, there by the voltage fed to the motor for regulating the speed. The experimental setup has improved the performance over PI controller. It is seen that the separately excited dc drive have low starting torque which limits its applications.

H.A.Yousef and H.M.Khalil have reported the dc series motor drive fed by a single phase controlled rectifier (AC to DC converter) and controlled by fuzzy logic. It has been concluded that the fuzzy logic controller provides better control over the classical PI controller which has improved the performance. It is also reported that the settling time and maximum overshoot can be reduced. Due to the inherent limitations, AC to DC converter fed drive introduces unwanted harmonic ripples in the output.

H.L.Tan has reported the dc series motor drive fed by a single phase full-bridge converter (DC to DC converter) controlled by fuzzy logic. It has been reported that the motor performance was simulated for different controllers like simplify fuzzy logic model (SFL), PI type fuzzy controller (FPI) and classical PI controller. The simulation result shows that the SFI provides superior performance over other controllers. It is found from the analysis that only the speed error has been taken as fuzzy input.

The proposed system utilizes the fuzzy logic controller and DC to DC converter. The drive system has the characteristics of precise, fast, effective speed reference tracking with minimum overshoot/undershoot and minimal steady state error. The fuzzy logic based speed command profile is followed even under load torque disturbances. In order to control the speed of such drive while maintaining the current at a limiting value, a fuzzy speed and ON/OFF current controllers have been designed.

PROPOSED SYSTEM

Figure 1 shows the block diagram of the proposed system. The system consists of DC-DC converter to drive the DC motor. A tacho generator is used to sense the speed and which is used for speed feedback. A micro-controller or a digital signal processor is used to generate the PWM signal to

switch the DC-DC converter, during the implementation of experimental setup.

The system two loops consist of namely outer fuzzy speed control loop and inner ON/OFF current control loop. In outer speed control loop, the actual speed (ω) is sensed by tacho generator and the error signal is obtained by comparing with reference speed (ω_r). From the present error and pervious error the change in error is calculated.

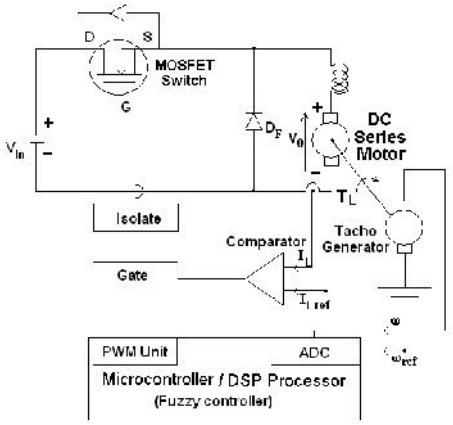

Fig 1. Block diagram of the proposed system

In the proposed system two input fuzzy controllers are used. The error and change in error are given as inputs to the fuzzy logic controller. The output of the fuzzy controller is denoted as duty cycle.

The change in duty cycle for the converter can be calculated from the new duty cycle and previous duty cycle. The input and output gain of the fuzzy controller can be estimated by simulation. The fuzzy controller can reduce the error to zero by changing the duty cycle of the switching signal.

MATHEMATICAL MODELING OF DC SERIES MOTOR AND DC-DC CONVERTER

DC Series Motor

The proposed system can be simulated with proper mathematic modeling. The DC motor can be written in terms of equations as follows.

$$\frac{di_a}{dt} = \frac{1}{L_a}\left[V_o - R_a i_a - K_{af} i_a \frac{d\theta}{dt} - K_{res}\frac{d\theta}{dt}\right] \quad (1)$$

$$\frac{d^2\theta}{dt^2} = \frac{1}{J}\left[K_{af} i_a^2 - B\frac{d\theta}{dt} - T_L\right] \quad (2)$$

where

$i_a = i_{se}$ - Motor current
V_0 - Motor terminal voltage
R_a - Armature resistance
L_a - Armature inductance
J - Moment of inertia
B - Friction coefficient
T_L - Load torque
$\omega = \frac{d\theta}{dt}$ - Angular speed
θ-Angular displacement
K_{af} - Armature voltage constant
and
K_{res} - Residual magnetism voltage constant

The non linear equations can be simulated with simulink as given in Figure 2. A nonlinear controller is desired to control the speed of the modeled DC motor. The fuzzy logic controller is the one of the best suited non linear controller, to control the DC motor .

Fig 2. Simulink model of DC series motor

DC-DC Converter

The DC-DC converter switch can be a Power Transistor, SCR, GTO, IGBT, Power MOSFET or similar switching device. In order to get high switching frequency (upto 100 KHz) the Power MOSFET may be taken as a switching device. Normally on state drop in the switch is small and it is neglected .

When the gate pulse is applied the device is turned on. During the period the input supply connects with the load. When the gate pulse is removed the device is turned off and the load disconnected from the input supply. The circuit and waveform of DC-DC converter is shown in Figure 3.

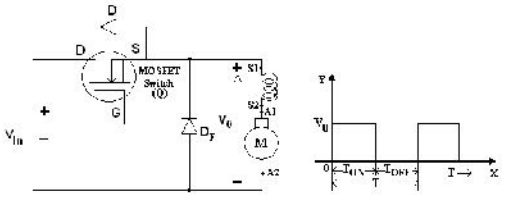

Fig 3. DC-DC converter circuit and waveform

The model equation for DC-DC converter is given by

$$V_o = \delta V_s \qquad (3)$$

$$\delta = \frac{T_{ON}}{T} \qquad (4)$$

$$T = T_{ON} + T_{OFF} \qquad (5)$$

where V_0 – Output Voltage

V_S – Input Voltage

T_{ON} – ON Time

T_{OFF} – OFF Time

T – Total Time

δ - Duty Cycle

The simulation operation of DC-DC converter is given in Table1.

Table1.
DC-DC converter switching operation

Operating mode	switch Position		Converter output voltage V_0		Load current i_o
	Motoring (Mode 1)	Free wheeling (Mode 2)	Mode1	Mode2	
Forward motoring	MOSFET (Q) ON	Diode (D_F) ON	Vs	0	$+ v_e$

IMPLEMENTATION OF FUZZY CONTROLLER IN MATLAB / SIMULINK

Fuzzy Logic Control (FLC)

The effective and efficient control using fuzzy logic has emerged as a tool to deal with uncertain, imprecise or qualitative decision making problems.

The FLC involves three stages namely Fuzzification, Rule-Base and Defuzzification. The Sugeno type controller is performed for present control because it has singleton membership in the output variable. Moreover it can be easily implemented and number of calculations can be reduced . The Structure of the fuzzy controller is shown in Figure 4.

Fig 4. Structure of the fuzzy controller.

Fuzzification

In Fuzzy logic system the linguistic variables are used instead of numerical variables. The process of converting a numerical variable (real

number or crisp variables) in to a linguistic variable (fuzzy number or fuzzy variable) is called fuzzification.

In this work, the motor variables are speed and current (i_a). The speed is controlled by FLC. The error e(k) and change in error Δe(k) is given as input to the FLC.

The error is found by comparing the actual speed ω(k) with reference speed ω_r(k). From the e(k) and pervious error $e_{pervious}$(k) the change in error is calculated and then it is normalized, in order to use the same FLC for different reference speed. Then the error and change in error are fuzzified. The equation for error and change in error are given in equation 6 and 7.

$$e(k) = \omega_r(k) - \omega(k) \quad (6)$$

$$\Delta e(k) = e(k) - e_{Pervious}(k) \quad (7)$$

Five linguistic variables are used for the input variable e(k) and Δe(k). That are negative big (NB), negative small (NS), zero (Z), positive small (PS) and positive big (PB). There are many types of membership functions, such as triangular-shaped, Gaussian, sigmoidal, pi-shaped trapezoidal-shaped, bell-shaped etc. the triangular membership function is used for simplicity and also to reduce the calculations. In order to reduce the number of membership variable the membership width is varied.

Normally seven membership variables are used to get accurate result. Here only five membership variables are used for the input, error and change in error. But the membership width for the center membership variable is narrow where as it is wide towards outer. The input and output fuzzy membership functions are shown in Figure 5.

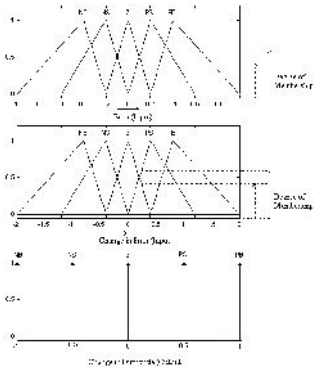

Fig 5. Fuzzy memberships used for simulation.

Defuzzification

The reverse process of fuzzification is called defuzzification. The linguistic variables are converted in to a numerical variable. As the weighted sum method is considered to be the best well-known defuzzification method, it is utilized in the present model.

The defuzzified output is the duty cycle dc(k). The change in duty cycle Δdc (k) can be obtained by adding the pervious duty cycle pdc(k) with the duty cycle dc(k) which is given in equation 8.

$$\Delta dc(k) = dc(k) + pdc(k) \quad (8)$$

Rule Table and Inference Engine

The control rules that relate the fuzzy output to the fuzzy inputs are derived from general knowledge of the system behavior, also the perception and experience. However, some of the control rules are developed using "trial and error" method .

The general rule can be written as

If e(k) is X and Δe (k) is Y, then Δdc(k) is Z

where X, Y and Z are the fuzzy variable for e(k), Δe(k) and Δdc(k) respectively.

The rule table for the designed fuzzy controller is given in the Table 2. The element in the first row and first column means that

If error is NB, and change in error is NB then output is NB.

Table2.
Fuzzy Rules

	NB	**NS**	**Z**	**PS**	**PB**
NB	NB	NB	NB	NS	Z
NS	NB	NB	NS	Z	PS
Z	NB	NS	Z	PS	PB
PS	NS	Z	PS	PB	PB
PB	Z	PS	PB	PB	PB

SIMULATION OF THE PROPOSED SYSTEM

The simulation of DC-DC converter fed dc series motor is done based on equation modeling technique, using MATLAB/simulink toolbox. The complete simulink model developed is given in Figure 6.

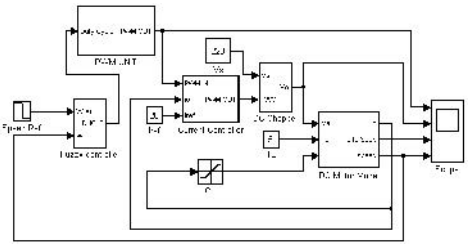

Fig 6. Simulink Model of the proposed system

The fuzzy controller block from fuzzy logic toolbox is used to test and evaluate the proposed fuzzy controller.

RESULTS AND DISCUSSION

The proposed model has been simulated using Matlab simulink toolbox. The fuzzy controller has been designed and DC-DC converter was tested. The simulated waves with MATLAB of input gate Pulse, Output Voltage, Motor Current and Speed with respect to time for ω_r=1800 rpm are shown in Figure 7. The expanded view is shown in Figure 8. The proposed model including fuzzy controller and DC-DC converter has been simulated using MATLAB simulation. The specification of DC series motor used for simulation is given in Table 3.

Table3.
Specifications of DC Motor

DC motor Parameters	Value
Motor Rating	5HP
Dc supply voltage	220 V
Motor rated Current	18 A
Inertia constant J	0.0465 Kg-m^2
Damping constant B	0.004 N.m.Sec./rad
Armature resistance R_a	1Ω
Armature inductance L_a	0.032 H
Motor Speed	1800 rpm
Armature voltage constant K_{af}	0.027 V.Sec./rad
Residual magnetism voltage const. K_{res}	

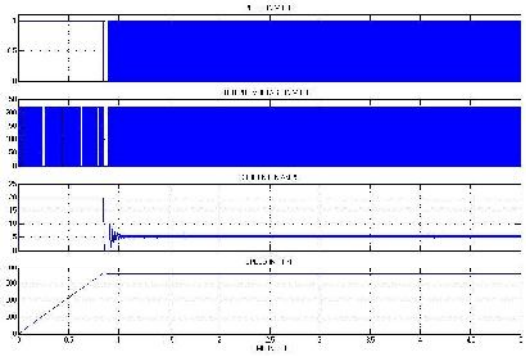

Fig 7. Pulse, Output Voltage, Motor Current and Speed Variation with respect to Time Response for ω_r=1800 rpm

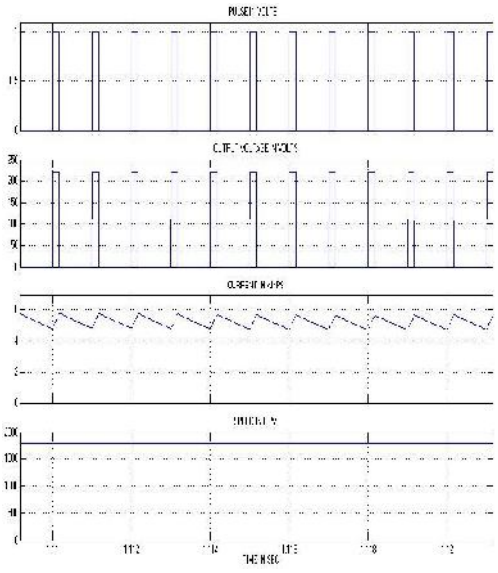

Fig 8. Expanded view of Pulse, Output Voltage, Motor Current and Speed Variation with respect to Time Response for ω_r=1800 rpm

The speed variation with respect to time and Current Variation with respect to time is shown in Figure 9 and Figure 10 respectively. The performance comparison of proposed system with the reference is given in Table 4.

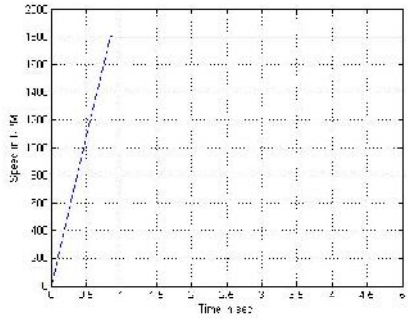

Fig 9. Speed Variation with respect to Time Response for ω_r=1800 rpm

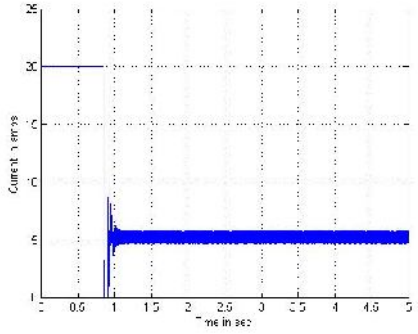

Fig 10. Motor Current Variation with respect to Time Response for ω_r=1800 rpm

Table 4.
Performance Comparison of proposed system with the reference for the speed ω_r=1800 rpm

Controller	Fuzzy [5]	Classical PI [5]	Fuzzy Proposed System
Settling time	1.7 Sec	2.67 Sec	1 Sec
Max. over Shoot	3.21%	6.72%	0.36%

The simulated result of speed regulation for a step change in the load torque of 25%, 50% and 75% applied at t=2 sec. From these figures, it is clear seen that the load influences the performance of the controller and hence the motor.

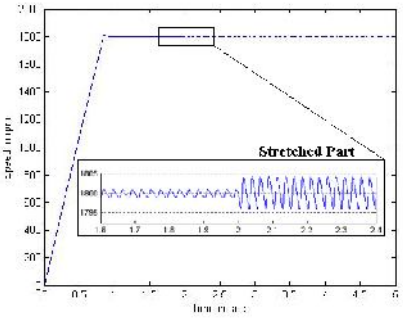

Fig 11. Speed variation for the step change in load torque (ΔT_L=25%) applied at t=2secs when the speed is 1800rpm.

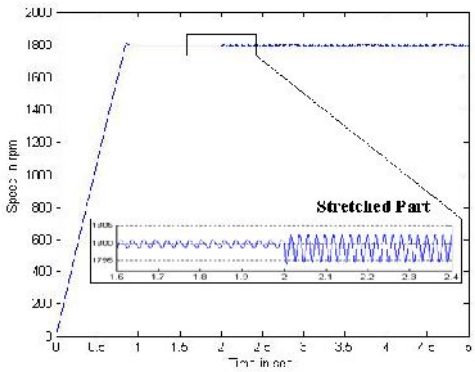

Fig 12. Speed variation for the step change in load torque (ΔT_L=50%) applied at t=2secs when the speed is 1800rpm.

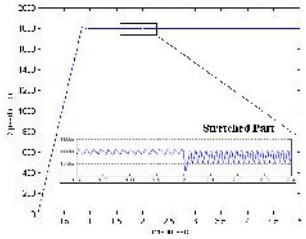

Fig 13. Speed variation for the step change in load torque (ΔT_L=75%) applied at t=2secs when the speed is 1800rpm.

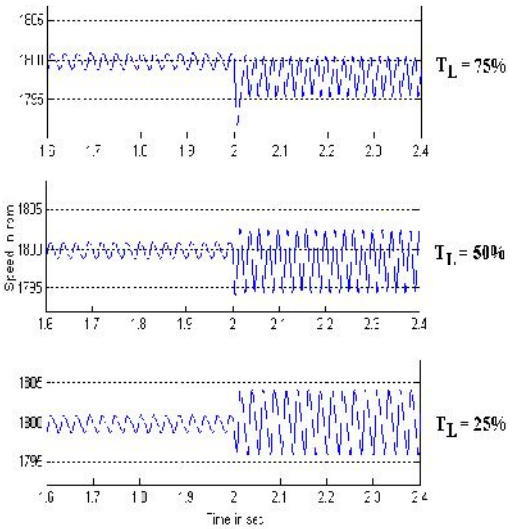

Fig 14. Comparison of Speed variation for the step change in load torque (ΔT_L=25%,50% and 75%) applied at t=2secs when the speed is 1800rpm.

From Figure 14 it is evident that the motor speed is function of the load torque and seen that when load is applied the motor takes it is sufficient time to reach the specified speed. The performance under various load condition is given in Table 5.

Table5.
Comparison of Speed variation under various load condition

Load	Variations in speed (rpm)	Speed Drop	Recovery Time (msec)
No Load	2	-	-
25%	8	0.2%	11
50%	7	0.3%	13
75%	6	0.4%	23

The Performance Comparison of proposed system with the work reported in is given in Table 6.

Table6.
Performance Comparison of proposed system with for the speed ω_r=1800 rpm and ΔT_L=5 N.m applied at t=2secs

Controller	Fuzzy [5]	Classical PI [5]	Proposed System
Max. over Shoot	3.21%	6.72%	0.36%
Max. Speed Drop	3.5%	5.26%	0.3%
Recovery time	2.4 Sec	2.82 Sec	0.01 Sec

The speed variation and the behavior of the system is given in Figure 15. It is seen from figure that when the speed is increased from 1000rpm to 1800rpm the motor takes 0.7sec whereas in the initial stage it took almost 0.8 sec to reach 1000rpm. This may be due to the inertia in the

beginning. RPM at t=4 sec. The set speed change is achieved with minimum transition time for both the case from lower speed to higher speed and higher speed to lower speed.

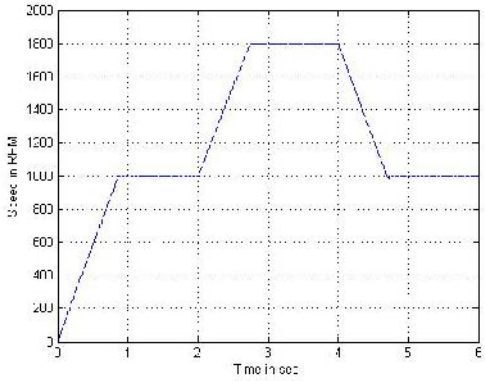

Fig 15. The variation of speed for the step change in set speed from 1000 to 1800rpm and 1800 t0 1000 RPM with rated load.

The speed Variation with respect to time and the current variation with respect to time for the reference speed 764rpm(ω_r = 80 rad /sec) is shown in Figure 16.

Comparing with, the proposed controller settling time is less (0.44 sec) than that the controller settling time (0.91sec) for SFL.Moreover the proposed system is simulated for higher power rating machine and the motor parameters are shown in the Table 3.

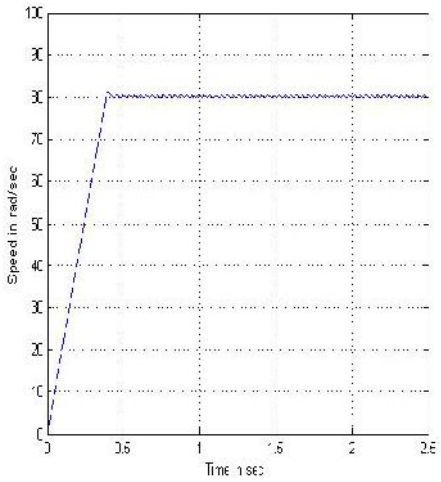

Fig 16. Speed Variation with respect to Time Response for ω_r=80rad/sec

By:

Prof.M.Muruganadam,
HOD\EIE

TECHS & APPS:

1. Vodafone has to come up with a new scheme "Pay Easy". They have decided to charge the first 100 calls of a Pay Easy customer @Rs1/-call the next 100 calls @Rs 1.25/-calls and the next 100 calls @Rs1.75/-call. Raj is a Pay Easy customer. He paid Rs 286.25/- as his mobile bill that month. How many calls did Raj make?
   a) 243 b) 241
   c) 242 d) 235

2. If 29th February 2004 was a Sunday, which of the following month starts with a Sunday in that year?
   a) September b) October
   c) August d) December

3. In a group there are 5 singers, 3 dancers, 2 artists, 1 musician, 1 guitarist and 1 teacher. The average height of the above mentioned people reduces by 2cm if I replace the guitarist with a joker. Find the height of the joker, if the height of the guitarist is 184cm.
   a) 154 b) 171
   c) 158 d) 160

4. A father with eight children takes 3 times to the zoological garden, as often as he can without taking the same 3 children together more than once. How often will he go and how often will each child go?
   a) 56,35 b) 92,42
   c) 56,21 d) 56,42

5. Find the missing term in the sequence 2,6,22,86,342,____
   a) 728 b) 1366
   c) 912 d) 1648

6. When 5% of total wheat is lost in grinding, a country can export 9 million tons of wheat, but when 6% of the total wheat is lost in the grinding it needs to import 2 million tons of wheat. What is the total production of wheat in the country? (In million tons)
   a) 1000 b)900
   c) 1100 d)1150

7. A man, a women and a boy can do a work in 20days, 30 days and 60 days respectively. How many boys must assist 2 men and 8 women to do the work in 2 days?
   a)4 b)5 c)6 d)8

8. Five digit numbers are formed using the digit 1,2,3,4 and 5 without repetition. The probability that a numbers so formed divisible 6 is
   a) 1/5 b)2/5
   c) 3/5 d)4/5

9. Eight coins are tossed together. The probability that all of them shows the same face is 1 in
   a) 256 b) 128
   c) 4096 d) 64

10. A hollow space on earth surface is to be filled. Total cost of filling is Rs20000. The cost of filling per mt3 is Rs 225 .how many times a size of 3 mt3 soil is required to fill the hollow space?
    a)88.88 b)66.66
    c)88.64 d)66.64

Answers

1. d	2.c	3.c	4.c	5.b
6. c	7.d	8.b	9.a	10.a

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"None of us is as smart as all of us. "