

ROBOTICS AND ADVANCED EMBEDDED SYSTEMS

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Abstract- The aim of this paper is to introduce about the exact meaning and importance of robotics and embedded systems . Robotics in the branch of mechanical engineering, electrical engineering , electronic engineering and computer science that deals with the construction, operation and application of robots as well as computer systems for their control , sensory feedback and information processing. Embedded systems is a computer system with a dedicated function within a larger mechanical or electrical system, often with real time computing constraints

Index Terms– embedded system, robotics, mechanical system, information processing, electrical system.

I. INTRODUCTION

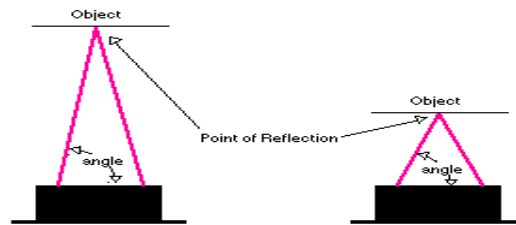
Robotics based machines is basically created because they can operate autonomously dates back to classical times, but research into the functionality and potential uses of robots did not grow substantially until the 20th century.

Embedded systems are often based on microcontrollers with integrated memory or peripheral interface are also still common , especially in more complex systems . in either case , the processors used may be types of ranging from general purpose to those specialized in certain class of computations , or even custom designed for the application in hand

In this research paper we study about the what makes machine a robot ,sensors, why do robots need sensors, what are sensors, types of sensors, history of robotics and embedded systems. In robotics system we study about the machines makes as robotics , sensors . Later on we study about embedded systems

V.B HOW IT WORKS?

The Sharp IR Range Finder works by the process of triangulation. A pulse of light (wavelength range of 850nm +/-70nm) is emitted and then reflected back (or not reflected at all). When the light returns it comes back at an angle that is dependent on the distance of the reflecting object. Triangulation works by detecting this reflected beam angle - by knowing the angle, distance can then be determined



The IR range finder receiver has a special precision lens that transmits the reflected light onto an enclosed linear CCD array based on the triangulation angle. The CCD array then determines the angle and causes the rangefinder to then give a corresponding analog value to be read by your microcontroller.

For example,

- 0 0 0 0 0 106 120 124 121 109 0 0 0 0
- 108 120 206 12 0 0 0 0 57 103 120 111 9 0
- 20 33 57 74 88 103 112 119 125 129 135 144 157 168 176

II. HISTORY OF ROBOTICS

In 1942 the science fiction writer Isaac Asimov created his Three Laws of Robotics.

In 1948 Norbert Wiener formulated the principle of cybernetics, the basis of practical robotics .

Fully autonomous robots only appeared in the second half of the 20th century .

The first digitally operated and programmable robot, the Unimate , was installed in 1961 to lift hot pieces of metal from a die casting machine and stach them . Commercial and industrial robots are widespread today and used to perform jobs more cheaply , more accurately , more reliably than humans .

III. WHAT MAKES MACHINE A ROBOT

There are three aspects for the machine to be a robot that is sensing, planning and acting.

The Major Components needed for Designing a Robot

Sensors: For Sensing the environments

Actuators: For Movement of robots and its parts

Control: Controller/Processor as brain of Robot

Intelligence: User Written Command to perform desired set of action

Power: A necessity for making a system work

Communication: Robot can talk to another robot/PC

IV WHAT IS SENSING ?

Sensing is collecting information from the world.

Sensing in an electrical /mechanical/chemical device that maps an environment attribute to a quantitative measurement

- Attribute mixtures-often no one to one map
- Hidden state in environment

Each sensor in based on transduction principle- conversion of energy from one form to another

Also known as transducers

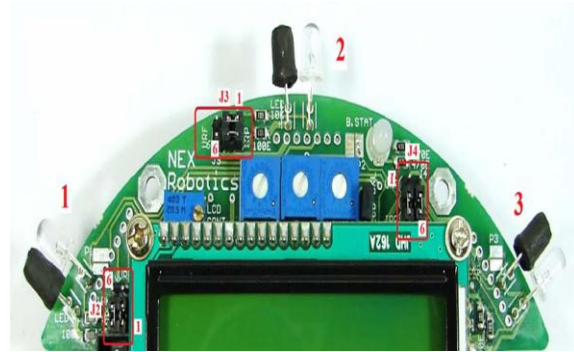
V. TYPES OF SENSORS

ACTIVE : send signal into environment and measure interaction with the environment

Eg. Radar, sonar

PASSIVE : record signals already present in the environment

V.C IR PROXIMITY SENSOR



White line sensors are used for detecting white line on the ground surface. White lines are used to give robot sense of localization.

White line sensor consists of a highly directional photo transistor for line sensing and bright red LED for the illumination.

Due to the directional nature of the photo diode it does not get affected with ambient light unless it is very bright.

When the robot is not on a white line, amount of light reflected is less, hence less leakage current flows through the photo transistor. In this case, the line sensor gives an output in the range of 2V to 3.3V. When the sensor is on a white line, more light gets reflected resulting in considerable increase in the leakage current which causes voltage across the sensor to fall between 2 to 0.1V.

V.C POSITION ENCODER

Position encoders give position / velocity feedback to the robot. It is used in closed loop to control robot's position and velocity. Position encoder consists of slotted disc which rotates between optical encoder (optical transmitter and receiver).

When slotted disc moves in between the optical encoder we get square wave signal whose pulse count indicates position and time period / frequency indicates velocity.

V.D ULTRASONIC SENSORS

An ultrasonic sensor has two parts:

A transmitter that sends out a signal that humans cannot hear

A receiver that receives the signal after it has bounced off nearby objects

The sensor sends out its signal and determines how long the signal takes to come back.

If the object is very close to the sensor, the signal comes back quickly

Eg. Video cameras

EXTEROCEPTIVE : deal with external world

- Where is something ?
- How does it look ?

PROPREOCEPTIVE :deal with self

- Where are my hands? (encoders, stretch, receivers)
- Am I balanced? (gyroscopes ,INR)

V. A SHARP IR SENSORS

- The Sharp IR Range Finder is probably the most powerful sensor available to the everyday robot hobbyist. It is extremely effective, easy to use, very affordable (Rs.), very small, good range (inches to meters), and has low power consumption.
- Sensors model in e-Yantra Lab.
- SHARP GP2Y0A41SK0F 4cm to 30cm IR Range Sensor
- SHARP GP2Y0A21YK0F 10cm to 80cm IR Range Sensor

If the object is far away from the sensor, the signal takes longer to come back

If objects are too far away from the sensor, the signal takes so long to come back (or is very weak when it comes back) that the receiver cannot detect it

The sensor sends a message back to the computer telling it the time taken for the signal to return. Then the brick uses this info to compute how far away the object is.

V.E MOTION SENSOR

These sensors detect and measure incoming infrared energy. The infrared ray is emitted by the heat of the body or any light sources. Depending upon the purpose of the sensor the range of IR filter can be limited to certain level. Most passive infrared sensors can actually detect emissions in the range of 8 to 12 micrometers.

They use a photo detector. which converts light in these wavelengths into an electrical current, which is run through a tiny computer housed in the unit. The alarm is triggered when the photo detector detects large or fast variations in the distribution of the emitted infrared energy. The output power is almost entirely provided by the measured signal without an excitation voltage.

VII EMBEDDED SYSTEMS

An **embedded system** is a computer that has been built to solve only a few very specific problems and is not easily changed. In contrast, a general-purpose computer can do many different jobs, and can be changed at any time with new programs for new jobs. An embedded system usually does not look like a computer, often there is no keyboard or monitor or mouse. But like any computer it has a processor and software, input and output. The word *embedded* means it is built into the system. It is a permanent part in a bigger system. For example, a controller is embedded in an elevator and tells the motor to move the elevator to different floors based on buttons that are pushed. A decoder is embedded in a satellite television set-top box to read a signal from the dish and send something that a TV understands. Often this type of system must do its work in a specific amount of time. This is called real-time computing. If a set-top box got interrupted to do another task, you would see a bad picture on the TV, for example. A general purpose computer will often have short pauses while it does something else, it is not real-time. Embedded systems control many of the common devices in use today, from card readers in hotel door locks to many controls in a car. They can be small like an MP3 player or a digital camera, to large systems like traffic lights, airplane controls, or assembly line controllers in a factor

V. CONCLUSION

After taking the training in robotics and embedded system, we can conclude that there are many applications and they can be highly increases if proper research in done in this field. There is nothing which we cannot achieve through from white line sensor robot to a robot which can sense human being these have various applications are can be easily where it difficult for humans to work. Embedded system is a very easy language which can be easily learnt and can be processed to work in robotics field

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