LGMD based Advanced Vision System for Gesture Recognized Micro Robots

k . velmurugan [1], R. kanimozhi [2], M.Mathumitha [3], P.Meenatchi [4],
[1]Assistant Professor/ECE, [2,3,4&5]UG Scholars
Electronics and Communication Engineering,
K. Ramakrishnan College of Technology

***Abstract*— Present a new bio-inspired vision system embedded for micro-robots with gesture control. The vision system takes inspiration from locusts in detecting fast approaching objects. Lobula giant movement detector (LGMD) is used to respond imminent collisions. In this work, present implementation of robot design and the activities of robot is monitor through computer. The various information in that place is transmitted through zigbee and displayed in the computer. The robot is controlled from the other place by using gesture control. This help to save human life and the use of gesture control help both uneducated , physically changelled people to operate the robot.**

Keywords— LGMD,temperature sensor ,gas sensor,zigbee transmitter.

I. INTRODUCTION

Temperature sensor and gas sensor are used to sense the temperature and gas in the unmanned area. Power supply used to convert 230V into +5v/12v according to the applications.ADC used to convert Analog signal into digital signal. The unmanned area monitored by camera. The temperature and gas are sensed and information sent to wireless mode and the information display in LCD. Robot operate based on the commands given. Operations are move right, left, front, back and pick the object. The ability to avoid a collision is an important issue for the autonomous mobile robots. There are different sensory systems which are used for collision avoidance such as ultrasonic, infra-red, laser, radar and vision system. However, it is still not an easy task for mobile robots to run autonomously in complex environments without human intervention.

Being able to see and react to the complex visual world is one of the fundamental ability for many animal species which brings in numerous inspirations. In robotics, there have been different visual based navigation and guidance modules proposed. Nowadays, as the image sensors and micro-controllers are becoming cheaper and more reliable, embedded vision modules are getting popular in intelligent device applications to enhance their navigation performance. This is because nobody pays attention to the activity which is conducted after the separation processes are over. After the separation is done, the sand particles which are of no use to the heavy mineral mining company is thrown back on the beach from where it was taken.

The vision system, working with other components of the robot such as motor control system, should cope with complex scenarios without compromise in collision detection. Thus we designed several experiments to test the robustness of the integrated vision system.

II. EXISTING TECHNOLOGIES

This work presents the concept and methodology as well as the architecture and physical implementation of an integrated node for smart-city applications. LGMD (lobulla giant movement detector) is used to respond to imminent collision. (camera) is placed at top of the robot in order to trace out the path of the robot and to detect obstacles. It take inspiration from the locust is nothing but a grass hopper which use a technique to detect and avoid collision in their path. Locust detect in such away that if it migrates from one region to another, the object moving towards it has high voltage. This high voltage can only reach the brain through nerve so named neurophysiologyrelated works

The ability to avoid a collision is an important issue for the autonomous mobile robots. There are different sensory systems which are used for collision avoidance such as ultrasonic, infra-red, laser, radar and vision system. However, it is still not an easy task for mobile robots to run autonomously in complex environments without human intervention.

III. PROPOSED SYSTEM

The concept of creating machines that 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. Throughout history, it has been frequently assumed that robots will one day be able to mimic human behavior and manage tasks in a human-like fashion.

Today, robotics is a rapidly growing field, as technological advances continue; researching, designing, and building new robots serve various practical purposes, whether domestically, commercially, or militarily. Many robots are built to do jobs that are hazardous to people such as defusing bombs, finding survivors in unstable ruins, and exploring mines and shipwrecks.

A temperature sensor measures the hotness or coolness of an object. The sensor's working base is the voltage that's

read across the diode. The temperature rises whenever the voltage increases. The sensor records any voltage drop between the transistor base and emitter. When the difference in voltage is amplified, the device generates an analogue signal that

IV. RELATED

LGMD (lobulla giant movement detector) is used to respond to imminent collision. (camera) is placed at top of the robot in order to trace out the path of the robot and to detect obstacles. It take inspiration from the locust is nothing but a grass hopper which use a technique to detect and avoid collision in their path. Locust detect in such away that if it migrates from one region to another, the object moving towards it has high voltage. This high voltage can only reach the brain through nerve so named neurophysiologyrelated works

The ability to avoid a collision is an important issue for the autonomous mobile robots. There are different sensory systems which are used for collision avoidance such as ultrasonic, infra-red, laser, radar and vision system. However, it is still not an easy task for mobile robots to run autonomously in complex environments without human intervention.

The vision system, working with other components of the robot such as motor control system, should cope with complex scenarios without compromise in collision detection. Thus we designed several experiments to test the robustness of the integrated vision system. Before doing these experiments, we introduced some motor commands to setup basic robot behaviours. 1) Motor Commands Description: In the real world tests, LGMD algorithm works together with motor commands.

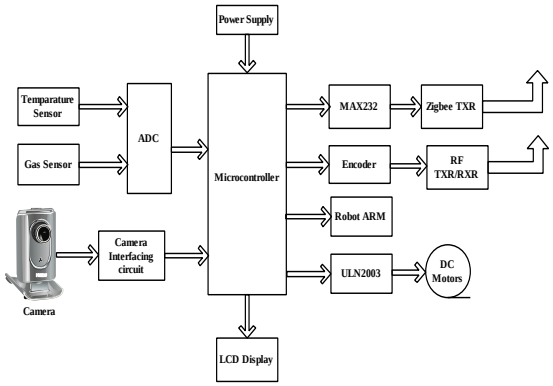
The vision module is reliable in different environment settings for collision detection which allows the micro-robot to perform avoidance behaviours pertinently and timely. Since all the image acquisition and processing functionalities are completed on one compact board, the vision system can be easily integrated to the micro-robot and other similar mini-robotics systems as well.

Being able to see and react to the complex visual world is one of the fundamental ability for many animal species which brings in numerous inspirations. In robotics, there have been different visual based navigation and guidance modules proposed. Nowadays, as the image sensors and micro-controllers are becoming cheaper and more reliable, embedded vision modules are getting popular in intelligent device applications to enhance their navigation

Amongst these modalities, vision often provide rich cues to interpret the real world as demonstrated in many animal species. In building artificial vision systems, one of the greatest challenges is to understand and deal with the dynamic scenes with complex background, moving objects and/or rapidly changing ambient light. Fast and reliable methods to address these problems are needed.

The images captured by the camera are transmitted through the digital camera interface (DCMI) which is an embedded camera interface.Robots can take on any form but some are made to resemble humans in appearance. This is said to help in the acceptance of a robot in certain replicative behaviors usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, and basically anything a human can do. Many of today's robots are inspired by nature, contributing to the field of bio-inspired robotics

V. BLOCK DIAGRAM



Visual based collision detection methods need to process massive volume of images in real time or need a real world model created in advance, which is either difficult to be completed on-board for a micro-robot with limited resources or hardly able to cope with dynamic environments.Different sensory systems which are used for collision avoidance still not an easy task for mobile robots to run autonomously in complex environments without human intervention.Complex background.Moving objects and/or rapidly changing ambient light.

The concept of creating machines that 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. Throughout history, it has been frequently assumed that robots will one day be able to mimic human behavior and manage tasks in a human-like fashion.

Robots can take on any form but some are made to resemble humans in appearance. This is said to help in the acceptance of a robot in certain replicative behaviors usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, and basically anything a human can do. Many of today's robots are inspired by nature, contributing to the field of bio-inspired robotics.

It has been found that it can respond to looming stimuli very quickly and trigger avoidance reactions. It has been successfully applied in visual collision avoidance systems for vehicles and robots. This paper introduces a modified neural model for LGMD that provides additional depth direction information for the movement. The proposed model retains the simplicity of the previous model by adding only a few new cells. It has been simplified and implemented on a Field Programmable Gate Array (FPGA), taking advantage of

The concept of creating machines that 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. Throughout history, it has been frequently assumed that robots will one day be able to mimic human behavior and manage tasks in a human-like fashion.

These technologies are used to develop machines that can substitute for humans. Robots can be used in any situation and for any purpose, but today many are used in dangerous environments (including bomb detection and de-activation), manufacturing processes, or where humans cannot survive. Robots can take on any form but some are made to resemble humans in appearance. This is said to help in the acceptance of a robot in certain replicative behaviors usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, and basically anything a human can do. Many of today's robots are inspired by nature, contributing to the field of bio-inspired robotics.

A liquid crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light- modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCD's are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden such as preset words, digits, and 7 – segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are madu up of a large number of small pixels, while other displays have larger elements.

The conversion involves quantization of the input, so it necessarily introduces a small amount of error. Furthermore, instead of continuously performing the conversion, an ADC does the conversion periodically, sampling the input. The result is a sequence of digital values that have been converted from a continuous-time and continuous-amplitude analog signal to a discrete-time and discrete-amplitude digital signal. An ADC is defined by its bandwidth and its signal-to-noise ratio. The bandwidth of an ADC is characterized primarily by its sampling rate. The dynamic range of an ADC is influenced by many factors, including the resolution, linearity and accuracy (how well the quantization levels match the true analog signal), aliasing and jitter.

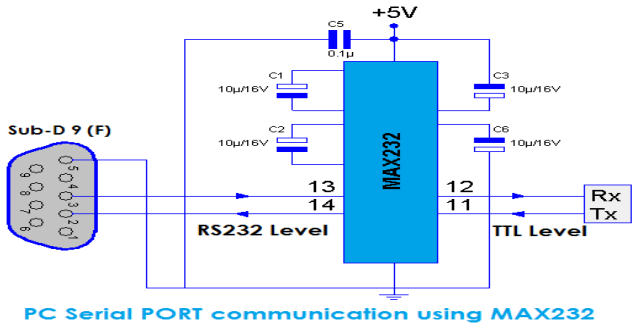
The vision system, working with other components of the robot such as motor control system, should cope with complex scenarios without compromise in collision detection. Thus we designed several experiments to test the robustness of the integrated vision system. Before doing these experiments, we introduced some motor commands to setup basic robot behaviours. 1) Motor Commands Description: In the real world tests, LGMD algorithm works together with motor commands.

There are three types of motor control commands which are 'F' for going forward, 'L' or 'R' for turn left or right and 'S' for stop.

VI. COMPONENTS

A. MAX232:

The MAX232 is an integrated circuit first created in 1987 by Maxim Integrated Products that converts signals from a TIA-232 (RS-232) serial port to signals suitable for use in TTL-compatible digital logic circuits. The MAX232 is a dual transmitter / dual receiver that typically is used to convert the RX, TX, CTS, RTS signals.



PC Serial PORT communication using MAX232

The drivers provide TIA-232 voltage level outputs (about ±7.5 volts) from a single 5-volt supply by on-chip charge pumps and externalcapacitors. This makes it useful for implementing TIA-232 in devices that otherwise do not need any other voltages.

The receivers reduce TIA-232 inputs, which may be as high as ±25 volts, to standard 5 volt TTL levels. These receivers have a typical threshold of 1.3 volts and a typical hysteresis of 0.5 volts.

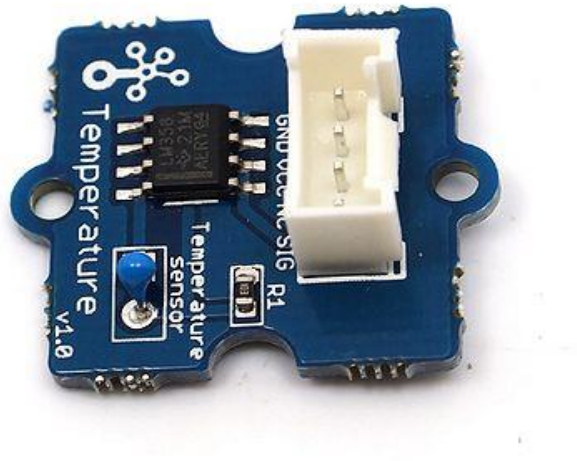
The MAX232 replaced an older pair of chips MC1488 and MC1489 that performed similar RS-232 translation. The MC1488 quad transmitter chip required 12 volt and -12 volt power,[1] and MC1489 quad receiver chip required 5 volt power.[2] The main disadvantages of this older solution was the +/- 12 volt power requirement, only supported 5 volt digital logic, and two chips instead of one.

The MAX232 replaced an older pair of chips MC1488 and MC1489 that performed similar RS-232 translation. The MC1488 quad transmitter chip required 12 volt and -12 volt power,[1] and MC1489 quad receiver chip required 5 volt power.[2] The main disadvantages of this older solution was the +/- 12 volt power requirement, only supported 5 volt digital logic, and two chips instead of one.

B) TEMPRATURE SENSOR

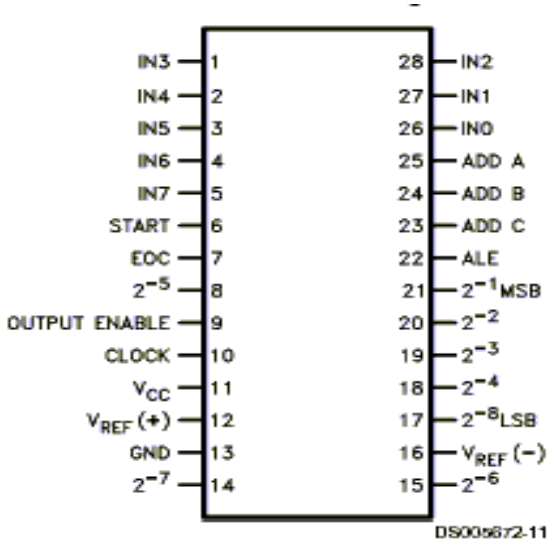
Temperature sensor and gas sensor are used to sense the temperature and gas in the unmanned area. Power supply used to convert 230V into +5v/12v according to the applications.ADC used to convert Analog signal into digital signal. The unmanned area monitored by camera. The temperature and gas are sensed and information sent to wireless mode and the information display in LCD. Robot operate based on the commands given. Operations are move right, left, front, back and pick the object. The ability to avoid a collision is an important issue for the autonomous mobile robots. There are different sensory systems which are used for collision avoidance such as ultrasonic, infra-red, laser, radar and vision system. However, it is still not an easy task for mobile robots to run autonomously in complex environments without human intervention.

A temperature sensor measures the hotness or coolness of an object. The sensor's working base is the voltage that's read across the diode. The temperature rises whenever the voltage increases. The sensor records any voltage drop between the transistor base and emitter. When the difference in voltage is amplified, the device generates an analogue signal A temperature sensor is a device, typically, a thermocouple or RTD that provides for temperature measurement through an electrical signal. A thermocouple (T/C) is made from two dissimilar metals that generate electrical voltage in direct proportion to changes in temperature.



C) ADC0809

It has been found that it can respond to looming stimuli very quickly and trigger avoidance reactions. It has been successfully applied in visual collision avoidance systems for vehicles and robots. This paper introduces a modified neural model for LGMD that provides additional depth direction information for the movement. The proposed model retains the simplicity of the previous model by adding only a few new cells. It has been simplified and implemented on a Field Programmable Gate Array (FPGA), taking advantage of the inherent parallelism exhibited by the LGMD, and tested on real-time video streams.



An ADC may also provide an isolated measurement, such as an electronic device that converts an input analog voltage or current to a digital number proportional to the magnitude of the voltage or current.

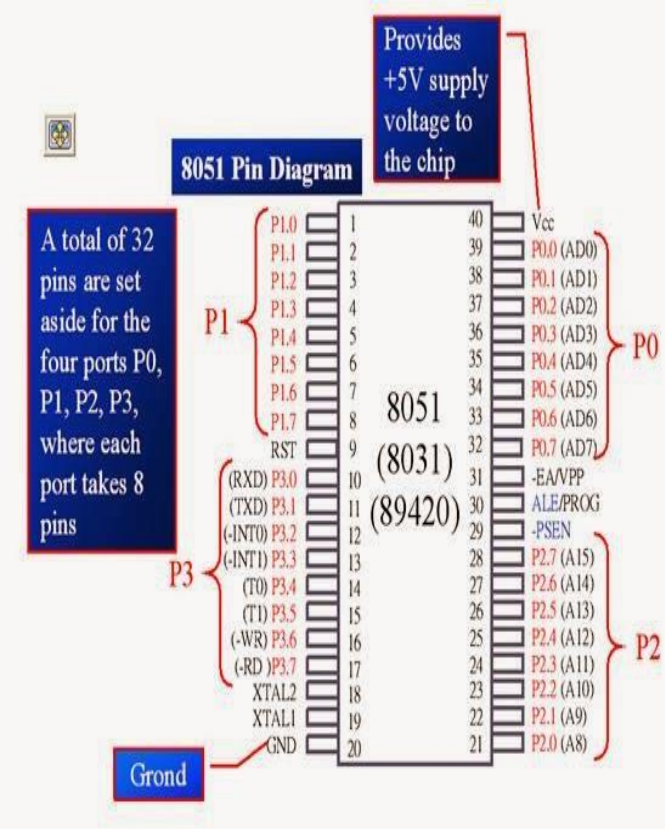
d) GAS SENSOR:

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

e) MICROCONTROLLER

A microcontroller (or MCU for microcontroller unit) is a small computer on a single integrated circuit. In modern terminology, it is a System on a chip or SOC. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems.



By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some microcontrollers may use four-bit words and operate at frequencies as low as 4 kHz, for low power consumption (single-digit milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications.

Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.

The MAX232 has two receivers that convert from RS-232 to TTL voltage levels, and two drivers that convert from TTL logic to RS-232 voltage levels. As a result, only two out of all RS-232 signals can be converted in each direction. Typically, the first driver/receiver pair of the MAX232 is used for TX and RX signals, and the second one for CTS and RTS signals. There are not enough drivers/receivers in the MAX232 to also connect the DTR, DSR, and DCD signals. Usually, these signals can be omitted when, for example, communicating with a PC's serial interface.

e) DC MOTOR

A DC motor is any of a class of rotary electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings.

The brushed DC electric motor generates torque directly from DC power Supplied to the motor by using internal commutation, stationary magnets (permanent or electromagnets), and rotating electrical magnets. Advantages of a brushed DC motor include low initial cost, high reliability, and simple control of motor speed. Disadvantages are high maintenance and low life-span for high intensity uses.

Typical brushless DC motors use one or more permanent magnets in the rotor and electromagnets on the motor housing for the stator. A motor controller converts DC to AC. This design is mechanically simpler than that of brushed motors because it eliminates the complication of transferring power from outside the motor to the spinning rot

VII. FUTURE WORK

Our idea is to design a automated micro robots in order to save the human life in this or robot is usefull to both the uneducated people and to save the human life.

VIII. CONCLUSION

Reliable, low-cost, compact and low power consumption visual collision detection and avoidance system has been in the wishing list for mini or micro-robots for a long time yet in supply. In the above chapters, the presented realization of LGMD model on one compact board with ARM chip showed a step closer to satisfy these demands. As demonstrated via various experiments, the vision module is reliable in different environment settings for collision detection which allows the micro-robot to perform avoidance behaviours pertinently and timely. Since all the image acquisition and processing functionalities are completed on one compact board, the vision system can be easily integrated to the micro-robot and other similar mini-robotics systems as well. For future work, the vision module can be extended by integrating other bioinspired neuron models for complex visual tasks, and for multiple robotics applications.

REFERENCES

[1] G. Eason, B. Noble, and I.N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529-551, April 1955. (*references*)
[2] J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68-73.
[3] I.S. Jacobs and C.P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G.T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271-350.
[4] K. Elissa, “Title of paper if known,” unpublished. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
[5] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740-741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
[6] M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.
[8] G. Benet, F. Blanes, J. E. Simo, and P. Perez, “Using infrared sensors for distance measurement in mobile robots,” Robotics and Autonomous Systems, vol. 40, no. 4, pp. 255–266, 2002.
[9] A. C. Silva, J. Silva, and C. P. d. Santos, A Modified LGMD Based Neural Network for Automatic Collision Detection. Springer, 2014, vol. 283, pp. 217–233.
[10] T. Krajn´ık, M. Nitsche, J. Faigl, P. Van˘ek, M. Saska, L. P˘reu˘cil, T. Duckett, and M. Mejail, “A practical multirobot localization system,” Journal of Intelligent & Robotic Systems, vol. 76, no. 3-4, pp. 539–562, 2014.