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Control Robot Anywhere Using Micro-controller for Scientific Purpose

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Abstract-:

Robotics is the study of robot. It is a mechanical intelligent agent which can perform tasks on its own guidelines. Robot is usually an electro-mechanical machine which is guided by computer and electronic programming. Robots can be autonomous or semi-autonomous and come in those two basic types which are used for research into human-like systems, such as ASIMO and TOPIO. In this concept we are specifying the robot controlling by using microcontroller which have some specific instructions that will operate robot with using sensors. Sensor will provide the activity of robot and also using for controllability of robot at any distance with radio frequency. This robot will operate at any voltage and power will generate through magnetic field and all the operations will be operated through the transmitting end. Receiver end will receive the instructions and send to accumulator of microcontroller for executing the task. This work is an overview of protocols in wireless sensor networks applied in the field of swarm robotics. The modeling of swarm intelligence resembles the social behavior and the optimization is done according to the application.

Keyword-: Robotics, ASIMO, TOPIO, Microcontroller, Wireless Sensor, Magnetic field, GSM or Network.

Introduction

In swarm robotics, the Wireless Sensor Networks (WSN) are deployed with autonomous nodes at large number with sensing capabilities, interfaces for communication which are mobile and helps to interact with the environment. WSNs are widely employed in surveillance, healthcare, building control, object tracking, etc., In general, WSNs, aggregate the sensed data and it is used for statistical inference utilized in different way, resulting in different network architectures based on the application implemented. The modern definition of a robot can be an electro-mechanical device which follows a set of instructions to carry out certain jobs, but literally robot means a 'slave'. Robots find wide application in industries and thus are called there as industrial robots and also in sci-fi movies as humanoids. This and coming articles will provide an introduction to the Robotics. Robots are known to perform tasks automatically without much human intervention, except for initial programming and instruction set being provided to them.

Challenges Faced During the Design of Routing Protocols for WSN-:

During the design of the WSN many challenges are faced as it has tiny nodes with lesser bandwidth, limited non rechargeable battery, little memory and with small bandwidth allocation. As a common node sink transmission connected to thousands of nodes has to transfer every bit that has huge data which has to maintain the redundant information with greater bandwidth and transmission power.

The main challenges are:

1) Automaticity and self organization
2) Minimal memory and computational components
3) Energy efficiency
4) Scalability
5) Characteristics of Traffic patterns matching the architecture
6) Support for the aggregation of network dat

Routing Protocol Taxonomy

It is mainly classified in four categories:

1) Data-Centric: No requirement of ID's for each node and follows multi-hop based transmission of data.
2) Hierarchical: Divide into small clusters and cluster node will be acting as a Intermediate.
3) Location based: Using the position of the node the data is retrieved thereby making network efficient.
4) QoS aware: multi constrained requests based transmission

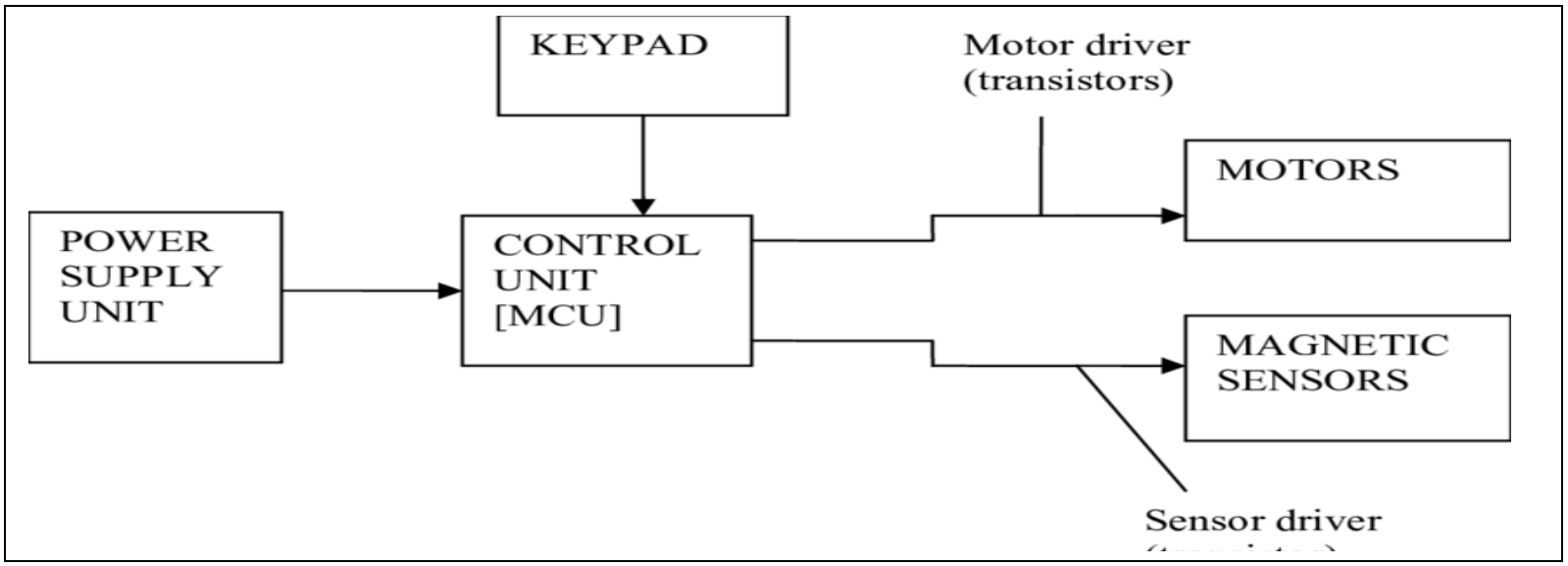

Figure 1- Basic block diagram

Microcontroller

The 89C51 has been specifically developed for control applications. As mentioned earlier, out of the 128 bytes of internal RAM, 16 bytes have been organized in such a way that all the 128 bits associated with this group may be accessed bit wise to facilitate their use for bit set/reset/test applications. These are therefore extremely useful for programs involving individual logical operations. One can easily give example of lift for one such application where each one of the floors, door condition, etc may be depicted by a single hit. The 89C51 has instructions for bit manipulation and testing. Apart from these, it has 8-bit multiply and divide instructions, which may be used with advantage. The pins of 89C51 are wired as:

- Pins from port 2 i.e., P2.0 (21) to P2.7 (28) to LCD data pins.
- Pins from port 3 i.e., P3.0 (10) to P3.2 (12) to LCD control pins.
- XTAL 1 (19) and XTAL 2 (18) to crystal
- Pins from port 3 i.e., P3.3 (13) to P3.5 (15) to Keyboard
- Pins from port 3 i.e., P3.6 (16) to Motor Driver IC L293d
- Pins No.9 is reset pin

Transmission

The transmitter is used to send the data generated by the sensors i.e. the movement of the hand. For this two sensors are used, MPU and flex sensors which are mounted on the hand glove. The location of the hand is tracked by the MPU sensor, the MPU gives the output with respect to x,y,z axis in the 3-D plane. The MPU is mounted on the hand glove and as we move our hand in space the MPU gives output regarding the x,y,z coordinates [1]. For pinching gesture the flex sensor is mounted on the index finger of hand glove which is used to sense the bending action and thus generate output which is used to create the pinching

action at receiver side [5]. So total of four variables are stored in the microcontroller which are x,y,z axis coordinates values and Rv the output of the flex sensor for picking gesture. All these values are transferred from the transmitter with the help of a communication module, in this case used NRF module. The data is sent in the form of packets each packet consisting x,y,z,Rv values the data transfer in the microcontroller is based on FIFO the first in first out mode [3]. In this module as there is no data transfer from receiver to transmitter used only one way communication i.e. from transmitter to receiver. In this way the hand gestures and movements are converted in to signals and transferred.

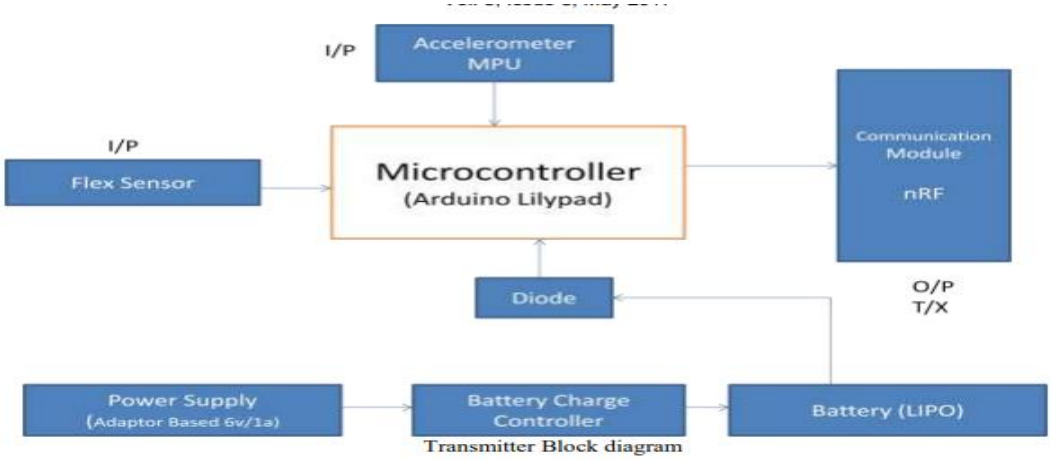

Figure-2- Transmitter Block Diagram

Receiving

At the receiver side the robotic arm assembly consists of servo motors, a microcontroller and receiving module. The receiving module receives the data sent by the transmitter this data sent to the microcontroller which decodes the data and generates the controlling signals for the servo motors accordingly and thus the robotic arm is able to carry out moves like up, down, rotating and pinching action. The block diagram describing the receiver side is shown in Fig

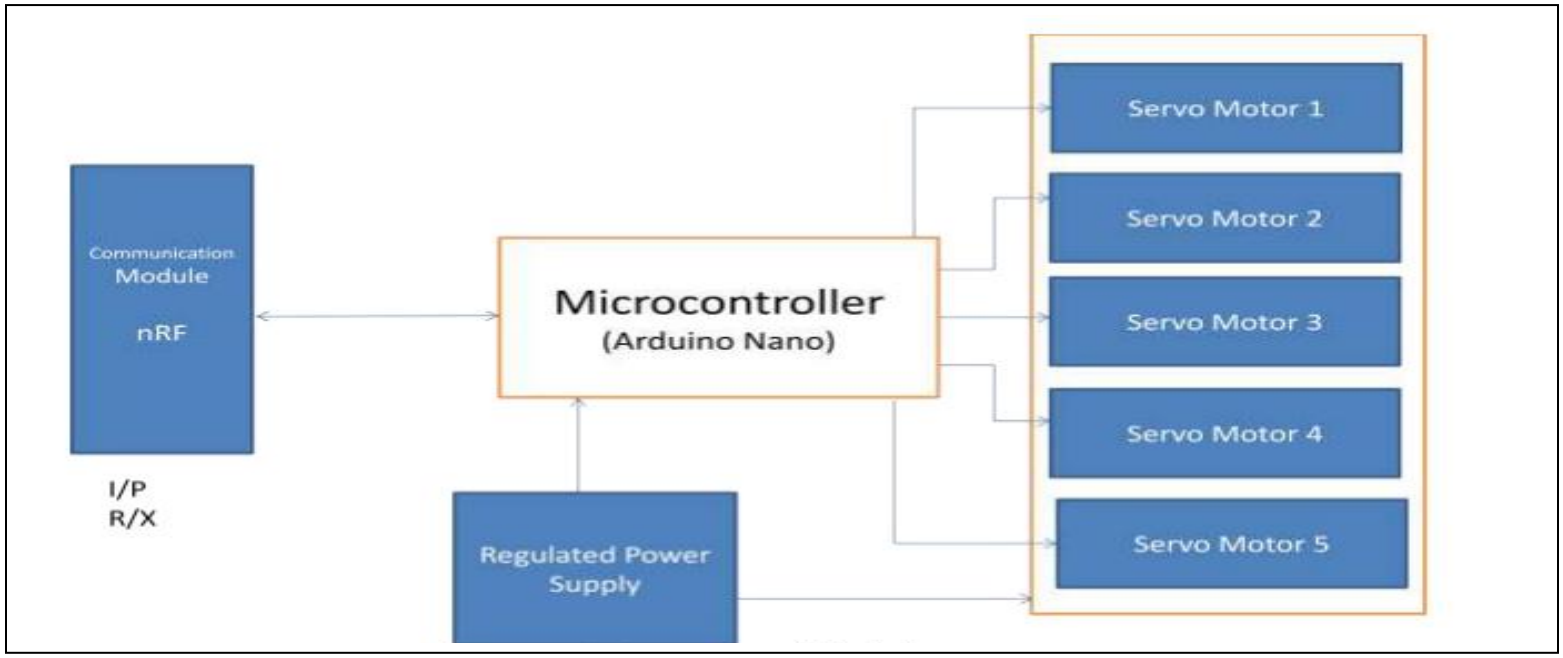

Figure 3 – Block Diagram Receiving

Advantages:

1. Ease of operation as motion sensors.
2. The complicated analog switches use is avoided.
3. The moves carried out with motion sensors are of high precision.
4. The moves carried out with motion sensors have high repeatability and consistency.
5. The speed of controlling the robot is increased.
6. As wireless mode of communication is used work place safety is increased.

Applications

There are numerous applications of gesture based technology, here the implemented gesture based technology to control the robotic arm could be used for picking and placing application in various industries such as in automobile industries, it could also be used to pick up small parts of the assembly line and place them in respective positions, it could be used as a safety gadget by army to pick up and diffuse bombs, as this robot is controlled wirelessly it could be used in hazardous environment such as gaseous explosions to carry out various tasks required.

Conclusion

This concept can use anywhere e.g. Space, industry or any specific place. We can use this robot in space for any kinds of work. It can also be use for lifting any object in space using transmitter instruction sensor will informing us about the robot and task accomplishment. We can make more powerful of this robot by increase it efficiency and can execute any task every time.

Reference -:

- https://www.brighthubengineering.com/robotics/26216-introduction-to-robotics/
- https://www.researchgate.net/publication/298788247_Application_Of_Wireless_Sensor_Networks_In_Robotics_Swarm_Intelligence
- https://www.researchgate.net/figure/Block-diagrams-of-a-Microcontroller-microElectronika-2004_fig1_229045477
- http://www.jncet.org/Manuscripts/Volume-7/Issue-3/Vol-7-issue-3-M-04.pdf
- https://www.ijireeice.com/upload/2017/may-17/IJIREEICE%2014.pdf
- https://www.engpaper.com/microcontroller-2017.html