BLUETOOTH BASED WIRELESS DEVICE CONTROL FOR INDUSTRIAL AUTOMATION USING ARDUINO

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ABSTRACT

This system presents a detail analysis of Bluetooth based industrial automation. This system is based on Arduino kit and Bluetooth module. Bluetooth which is used as data transmission is at its high rate. Automation in this field is mandatory to ensure the safety of the workers. This system also uses the android app for controlling operations of the elements. Due to android app distance is maintained from big machines, so there is no need to go closer and make the operations. Pneumatic cylinders will co-ordinate to the system as well as give the accuracy in operation of crushing. Inductive sensors carried out process of sorting of metal and non-metal efficiently. System is totally based on correct combination of conveyer, inductive proximity sensors and pneumatic cylinder. On conveyer there is an input of both metal as well as non-metal material. Then system will sort it with the help of sensors and sorted metal will be pushed out in the crusher box to crush it. Once metal can drop into box then it will be crushed and collected in the bean.

INTRODUCTION

The main purpose of "Bluetooth Based Wireless Device Control for Industrial Automation Using Arduino is to get knowledge of design and fabrication. The design is an environment friendly and uses simple properties such as mechanical single conveyer and automation properties which uses microcontroller and sensor. The design is done so that knowledge of designing, mechanism increased. In order to reduce the waste, system created the can crushing system that will reduce the volume of aluminum cans by approximate 60-75%. This System saves space of recycling. in today's life most of the food items are packed in cans and metal containers. Cold drinks and beverages are also packed in cans. Storage is often a problem and cans consume lot of space, thereby increasing total volume of waste. The transportation cost is also high for moving such a huge number of cans. Thus this system will help to recycle and maintain eco-friendly environment.

This system involves the process of designing the different parts of the crusher system considering the forces and ergonomic factor for people to use. This system mainly about generating a new concept of can crusher that would make easier to bring anywhere and easier to crush cans. After design has completed, it was transformed to its real product where the design is use for guidelines.The most frequent use of aluminum is in beverage cans. Since we use aluminum so frequently it is important to get as many uses out of it as we can. Recycling aluminum not only helps to keep the landfills clear but it also saves energy. The aluminum can today is the most recycled of any beverage container. Aluminum is durable, flexible, lightweight, strong and Recyclable. most of aluminum ever produced is still in use. Aluminum building components can be repeatedly recycled back into similar products with no loss of quality and reliability.

INDUCTIVE SENSOR
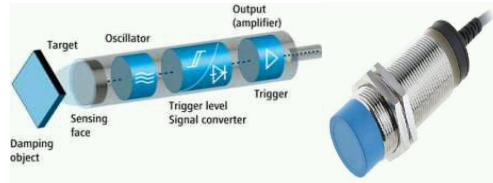
Fig.Inductive sensor

Inductive sensors exploit the interaction of metallic conductors with their alternating electromagnetic fields. Eddy currents are induced in the conductor. They draw energy from the field, reducing the oscillation amplitude. This will give accurate results in variations of voltage levels and currants. The area through which the high-frequency sensor field enters space is described as the active area.

Sensors are havingvarious ranges of operation in which it will give outputs. Inductive sensor having range in "mm". Here we are going to use 5 to 10 mm range of inductive sensor. In below fig. cross section area of inductive sensor is shown. This sensor is purely industrial. This electronic equipment which having some sort of sense, it will help out to identify the metals and non-metals. There are various sensors working for automation in industries. This type of sensors are also known as proximity sensor. It having capacity to detect metal which will give high output when it is in the range of sensor.

Because of their functional principle, inductive sensors are only suitable for detecting metal objects. But they do this extremely reliably and are also very robust and resistant which makes them interesting for numerous industrial applications. Inductive sensors are extremely precise due to their high repeatability levels. Their simple design and uncomplicated commissioning ensure minimal downtimes. Whether in robotics, in assembly and handling, in factory automation or mechanical engineering.

DC GEAR MOTOR

Small, simple gear DC motors (a made up name) are the little can motors found in many consumer electronics products. Conveyers, Cell phone vibrators, Mechanized toys, CD tray ejectors, etc. all contain little DC gear motors. To use them you simply hook up an appropriate DC voltage source (usually 3-12v) to the two terminals. They tend to spin very quickly, which maybe be good or bad, depending on your application. Their speed can be controlled (within a fairly small range) by varying the source voltage, but performance (torque) will suffer at lower voltages.

Fig. DC gear motor

The synchronous electronics DC gear motor belongs to the family of electric rotating systems. Other members of the family are the direct-current (DC) motor or generator, the induction motor or generator, and a number of derivatives of all these three. What is common to all the members of this family is that the basic physical process involved in their operation is the conversion of electromagnetic energy to mechanical energy, and vice versa. Therefore, to comprehend the physical principles governing the operation of electric rotating systems, one has to understand some rudiments of electrical and mechanical engineering.

DC gear motor is used because it gives enough torque to give proper motion to conveyer. Here we can use stepper motor also for better torque. DC gear motor having specific RPM(Rotation per Minute). It will give exact information about speed of the motor so it will rotate the conveyer. It can withstand with high load than normal DC motor. There are lots of beneficial aspects which are with DC gear motor. Almost every mechanical movement that we see around us is accomplished by an electric motor.

Electric machines are a means of converting energy. Motors take electrical energy and produce mechanical energy. Electric motors are used to power hundreds of devices we use in everyday life. Motors come in various sizes. Huge motors that can take loads of 1000's of Horsepower are typically used in the industry. Some examples of large motor applications include elevators, electric trains, hoists, and heavy metal rolling mills. Examples of small motor applications include motors used in automobiles, robots, hand power tools and food blenders.

PNEUMATIC CYLINDER

Fig: Pneumatic cylinder

There series of cylinders which are used as per calculated requirements. When we developed our required cylinder range, we started from specifications. It is interfaced to the sv (solenoid valve)

This cylinder is interfaced indirectly through sv to the microcontroller and operated as per the programs designed and burned.

BLUETOOTH MODULE

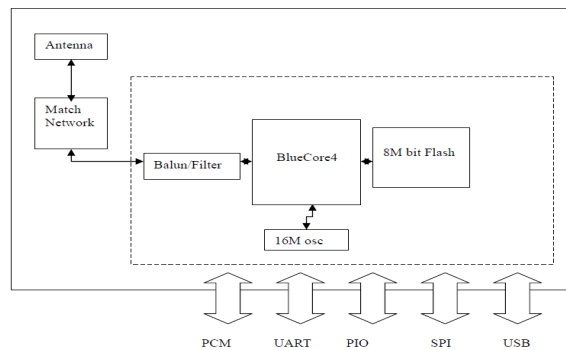Fig.1 Block Diagram

WHAT IS BLUETOOTH?

Bluetooth is a standard used to replace wired connections between electronic devices like cellular telephones, computers, and many other mobile devices. This technology allows to the users instantaneous connections of analog and digital information between several

devices. The way of transmission used assures protection and creates secure protocol against interferences and safety in the sending of information. The Bluetooth is a small microchip that operates in a band of available frequency throughout the communication area.

HOW IT WORKS?

Every device will have to be equipped with a microchip (transceiver) that transmits and receives in the frequency of 2.4 GHz that is available in the whole world (with some variations of bandwidth in different countries). Besides the information, there are three channels of voice available.The information can be exchanged to speeds of up to 1 megabit for second (2 megabits for second in the Second Generation of this Technology). A scheme of "frequency hop" (jumps of frequency) allows to the devices to communicate inclusive in areas where a great electromagnetic interference exists. Besides that is provided with schemes of encryption and check.

SPECIFICATION

1. Chips: CSR BC417143

2. Bluetooth Protocol: Bluetooth Specification v2.0 +EDR

3. Working Frequency: 2.4-2.48GHz unlicensed ISM Band

4. Modulation Mode: GFSK (Gaussian Frequency Shift Keying)

5. Power: -4dBm, Class 2

6. Transmission Distance: 20-30 in free space

7. Sensitivity: -84 dBm at 0.1% BER

8. Transmission rate: Asynchronous: 2.1 Mbps (Max)/160 kbps; Synchronous:1Mbps/1Mbps

9. Security: Authentication and encryption

10. Support profiles: Bluetooth serial port

11. LED indicator: LINK

12. Power Supply: +3.5V-+8V DC/50 mA

13. Working Temperature: -20°C-+55°C

14. Dimension: 43x19.3x11mm

15. Default serial setting: 9600/N/8/1

ACTUAL METHOD
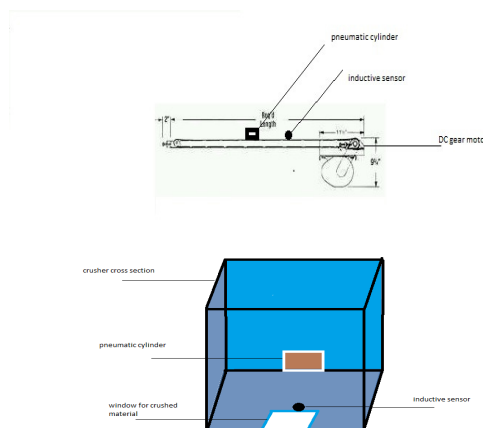
This system is about to sorting and crushing Metallic Can's. Sorting is done with the help of Inductive sensor. Inductive sensor does the work of differentiating between metal and non-metal. We are proving non-metal object as Plastic bottles and metal as a Tin can. After differentiating content of conveyer motor will push metal cans into the crusher. When sensor gives high output then motor will activate and it makes one rotation to push the cans. In between Arduino controls all the activities of system. All switching of conveyer portion is in control of Bluetooth module via android application. This gives user friendly graphical interface to user. If we increase the speed of the conveyer, then other assembly also increase their speed automatically as all the instruments are synchronized to each other operation. When conveyer is switched ON then and then only other assembly will start working otherwise no other component will work.
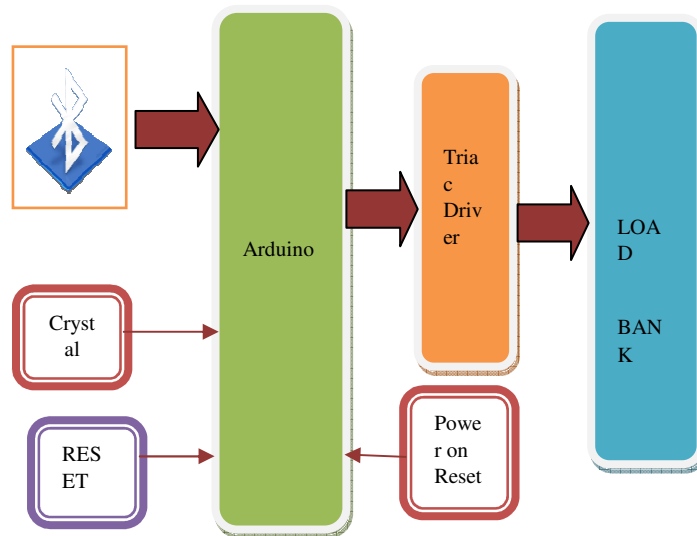
Fig. Block diagram of the System

Now, can is in crusher with the help Hooper it tilts and falls horizontal in the box called as Crusher. There is another inductive sensor to detect presence of metallic can, input to crusher which indicates that can is ready to get crushed in that box properly. Here we uses inductive sensor preferably over IR sensor because due to some reasons human being is working there for maintenance, then IR sensor will also give high output and the are chances of accident. Another remedy for this condition is that system is synchronized. Once can is detected then pneumatic cylinder receives input. After receiving input through (SV) solenoid valve creates one stroke for crushing the can. In one stroke of cylinder it makes to and fro motion. It is primarily in the normal position, to crush the can it will go forward and then comes to the (initial) back position. Delay between this one strokes is decided in programming and can be changed accordingly.

Finally can is crushed then it will be collected in bin. Crusher having small window to pass this crushed can. Whole operation is executed in super vision of Bluetooth android application. This creates comfort zone for user and also important for safety purpose. This type of system is used for molding the metal sheets in automobile industries. Pneumatic having variety according to size and power. For greater power combination of SV and cylinder size can be checked accordingly. This system is time efficient and gives proper output. For crushing material here we can use another thing which is heavy in weight. There is problem of lifting of load. Pneumatic is easy to use but complicated in set up.

We can compromise with the software as well as hardware but we have to take care about safety and comfort for user. It having tremendous amount of benefits which are important in circle of automation. After crushing the cans it will be collected to process it for making new cans. Cold drink cans recycle process having this methodology basically. It prefers different methods for crush it primarily because it needs only crushed cans. It requires large number of man power to do this work. We do this smartly with accuracy and work is time efficient. Working of wireless can crusher makes difference from other can crushers. Our focus is automation in industry, so we goes for sensors and pneumatic.

CONCLUSION

The above design system is been adopted for the fabrication of Automatic Can Crusher system as well as automation in industry. Thus, with help of this design and some other electronic components we can fabricate an automatic can crusher system to simply reduce the volume of cans as well as to reduce the man power.

REFERENCE

[1] The official Bluetooth website from Bluetooth SIG: http://www.bluetooth.com

[2]Neng- Shiang Liang; Li-Chen Fu; Chao-Lin Wu. "An Integrated flexible and Internet-based control architecture for home automation system in the internet era".Proceedings ICRA `02. IEEE International Conference onRobotics and Automation, Vol. 2, pp.1101-1106, 2002.

[3] E.Yavuz, B. Hasan, I. Serkan and K. Duygu. "Safe and Secure PIC Based Remote Control Application for Intelligent Home". International Journal of ComputerScience and Network Security, Vol. 7, No. 5, May 2007.

[4] B. Koyuncu. "PC remote control of appliances by using telephone lines". IEEE Transaction on ConsumerElectronics, Vol. 41, Issue 1, pp.201-209, 1995.

[5] S. Schneider, J. Swanson and Peng-Yung Woo. "Remote telephone control system". IEEE Transaction on ConsumerElectronics, Vol.43, Issue 2, pp.103-111, 1997.

[6] K.Tan, T.Lee and C.YeeSoh. "Internet-Based Monitoring of Distributed Control Systems-An UndergraduateExperiment". IEEE Transaction on Education, Vol. 45, No.2, May 2002.

[7] N. Swamy, O. Kuljaca and F. Lewis. "Internet-Based Educational Control Systems Lab Using Net-meeting".IEEE Transaction on Education, Vol. 45, No. 2, pp.145-151, May 2002.

[8] P. Lin and H. Broberg. "HVAC Applications". IEEE Industry Applications Magazine, pp.49-54, January 2002.

[9] A.R.Al-Ali and M. AL-Rousan. "Java-Based Home Automation System". IEEE Transaction on ConsumerElectronics, Vol.50, No. 2, May 2004.

[10] N. Sriskanthan and Tan Karand. "Bluetooth Based Home Automation System". Journal of Microprocessors andMicrosystems, Vol. 26, pp.281-289, 2002.