

ARM BASED FIXTURES MONITORING OF CNC MACHINE

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Abstract – This paper introduce a system that used ARM based microcontroller and wireless sensors to control the various devices and to monitor the information regarding the CNC machines parameter using WI-FI technology. If there is any error in machine it can't be recognized by the person sitting in the office. The existing system is difficult to maintain. This consumes lot of time on communication between technical persons. To overcome this problem we are trying to develop the system. This system will give a informationto the respective technical person according to the error detected. This paper introduce a system that used ARM basedmicrocontroller and wireless sensors to control the various devices and to monitor the information regarding the CNC machines parameter using WI-FI technology. This consumes lot of time on communication between technical persons. To overcome this problem we are trying to develop the system. This system will give a information to the respective technical person according to the error detected. This consumes less time.

Keyword- ARM(Advanced RISC Machines); WI-FI (wireless fidelity)

I. INRODUCTION

CNC machine is having three sections Hydraulic Section Mechanical Section and electrical section. So while working with so much of machines this EMI section gets problem. When any of the machines stop working because of any internal problem, it gives an alarm so that worker should know that there is some problem with that machine. But if worker can't recognise the problem then he should inform this to concerned technical person. But worker will inform this to all technical person from mechanical section, Hydraulic section and also to electrical section. This consume a lot of time. Vibration is one of the most concentrated problems in CNC machine tools, which can reduce the machining precision significantly[1]. This lead to decrease in production because of difficulty in tracing the error by technical person. To reduce this time delay we are implementing one system. This system help will technical person instantly as error will be introduced through the text message. This text message will include machine number and actual error occurred in that machine. And this text message will be send to only the section related that technical person. While message is sending to that respective person machine will be switched off. Wireless mesh networks often consist of mesh clients, mesh routers and gateways[3]. A WMN is reliable and offers redundancy[3].

II. LITRATURE SURVEY

John T. Parsons invented the CNC while making helicopter blades for the military. His numerical control used a rudimentary computer to move the cutting spindle along the x and y axes.

The CNC machine first appeared when John Runyon managed to produce punch tapes under computer control. This showed dramatic results in terms of time, reducing the normal production duration of 8 hours to 15 minutes. In June 1956, the Air Force accepted the proposal to produce a generalized "programming" language for NC.

Eventually, the Air Material Command at the Wright-Patterson Air Force Base and the Aircraft Industries Association (AIA) collaborated with MIT in 1957 to generate a fully computer controlled NC system. The invention of CNC machines paved the way for automated tools that meant cost efficient production for manufacturers.

The computer automation of manufacturing now uses very sophisticated programs to cut parts on several axes, including the original x and y grid. CNC mills can now cut at various angles, and even have moving tables that turn the part to access areas previously impossible to reach.

III. SYSTEM BLOCK DIAGRAM

We have used a ARM7 based LPC2148 microcontroller. LPC2148 is a 16bit/32bit microcontroller with a high speed flash memory ranging from 32kbit to 512kbit.

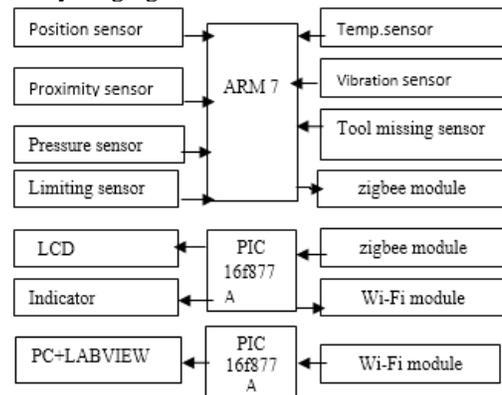


Fig. 1: System Block diagram

Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. PIC 18f458 is used outside the CNC machine PIC 18f458 is used to monitor the lcd and indicator and wi-fi module. PIC 18f458 is having 10 bit 8 channel ADC. PIC 18f458 is also used at the slav side to monitor the wi-fi module and the pc. we can see the data of CNC with the help of labview software.

A. Hall Effect Sensor:

A device which converts magnetic or magnetically encoded information into electrical signals is called HALL EFFECT SENSOR. A Hall Effect device/sensor is a solid state device that is becoming more and more popular because of its many uses in different types of applications Hall Effect devices are immune to vibration, dust and water. The Basic Principle of Hall Effect is the activation by an external magnetic field. As we are familiar that there are two important characteristics of a magnetic field. Viz. Flux density, (B) and polarity (North & South Poles). When the magnetic flux density around the sensor exceeds a certain preset threshold, the sensor detects it and generates an output voltage called the Hall Voltage, V_H . [6]

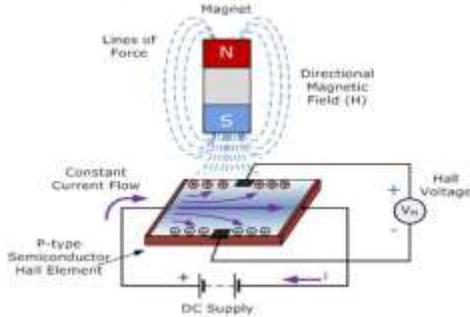


Fig2: Working of Hall Effect

B. Limit switch:

A limit switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection. It can determine the presence or absence of an object. It was first used to define the limit of travel of an object; hence the name "Limit Switch."

Actuator: The portion of the switch that comes in contact with the object being sensed.

Head: It houses the mechanism that translates actuator movement into contact movement. When the actuator is moved as intended, the mechanism operates the switch contacts.

Contact Block: It houses the electrical contact elements of the switch. It typically contains either two or four contact pairs.

Terminal Block: The terminal block contains the screw terminations where the electrical (wire) connection between the switch and the rest of the control circuit is made.

Switch Body: The switch body houses the contact block in a plug-in switch. It and terminal block in the nonplug-in switch.

Base: The base houses the terminal block in a plug-in switch do not have a separate base [5]

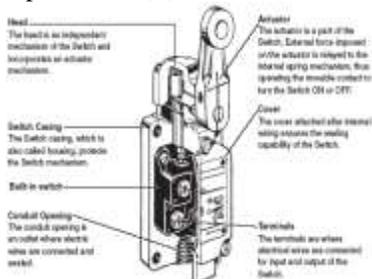


Fig3: limit switch

C. Inductive Proximity Sensor:

Inductive Proximity Sensors detect the presence of metal objects which come within range of their oscillating field and provide target detection to "zero speed". Internally, an oscillator creates a high frequency electromagnetic field (RF) which is radiated from the coil and out from the sensor face (See Figure 1). When a metal object enters this field, eddy currents are induced into the object. As the metal moves closer to the sensor, these eddy currents increase and result in an absorption of energy from the coil which dampens the oscillator amplitude until it finally stops.

Selection of the proper proximity sensor depends on the size, material, and spacing of the target being sensed and the sensing distance that can be maintained. The maximum sensing distance is defined as the distance in which the sensor is just close enough to detect a ferrous target whose diameter is equal to or greater than the sensor diameter. In

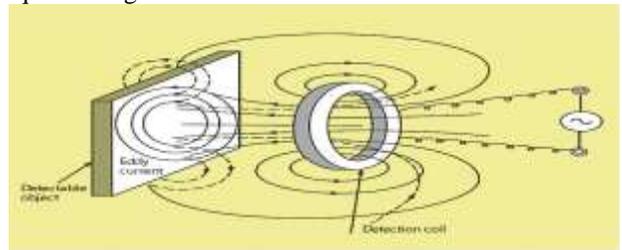


Fig4: structure of proximity sensor

D. Temperature sensor:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.



Fig5: temperature sensor

E. Vibration sensor:

Sensor is made up of a small spring mechanism, which makes the contact ON when the applied vibration force is at above a certain threshold. It has two legs coming out of it. Normally the two terminal are insulated by a resistance value more than 10M Ohm. When someone applies vibratory force on the switch, spring inside the switch vibrates and makes a momentary short circuit between the two terminals.



Fig6: Internal structure of vibration sensor



Fig7: Diagram of vibration sensor

F. Position sensor:

ingot outer diameter measurement with a contact displacement sensor

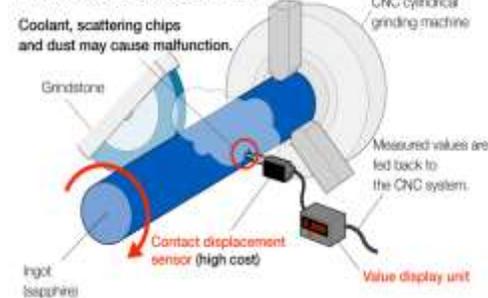


Fig8: position sensor

Position sensor used in cncmachines used Grindstone, ingot, value display unit,cnc cylindrical grinding machine and the system which measured values which are fed back to the cnc machines and contact displacement sensore.

G. Wi-Fi module:

Wi-Fi is the name of a popular wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections.

Wi-Fi is supported by many applications and devices including video game consoles, home networks, PDAs, mobile phones, major operating systems, and other types of consumer electronics. Any products that are tested and approved as "Wi-Fi Certified" (a registered trademark) by the Wi-Fi Alliance are certified as interoperable with each other, even if they are from different manufacturers. For example, a user with a Wi-Fi Certified product can use any brand of access point with any other brand of client hardware that also is also "Wi-Fi Certified". Products that pass this certification are required to carry an identifying seal on their packaging that states "Wi-Fi Certified" and indicates the radio frequency band

used (2.5GHz for 802.11b, 802.11g, or 802.11n, and 5GHz for 802.11a).[3]

H. Liquid Crystal Display:

LCD is used in a project to visualize the output of the application. We have used 16x2 lcd which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 lcd.

LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus lcd plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

I. PC:

PC is used to analysis the various parameters of CNC machine using a labview software developed window. Using pc we can analysis the intensity of errors happened and the necessary solution can be started well on time.

IV. CONCLUSION

Thus we can say that we can use this system in various industries. This system will definitely help us to remove errors as early as possible. So, because of this system production rate of the industry will increase. As human communication errors are removed, communication between worker and technical person will be very fine. This system will also keep record of errors and technical person dealing with that error. So, this will be helpful for company while analysis.

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