Smartphone Controlled Electrical Machine

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Abstract - This project deals with the android based Wi-Fi motor control system. To implement the system MIT app developer-2, Arduino microcontroller board, Bluetooth module and Android operating system are correlated. The system is capable of controlling the induction motor without manual switches and reduces the wirings in conventional system and hence the maintenance gets reduced. Implementing this system in industrial automation application, convenience of controlling the speed and tasks like start, stop, jogging and braking of the induction motor is achieved remotely by using Android based smart phones. This operation is achieved by any smart phone or Tablet with Android OS with Graphical User Interface based touch screen operation. Android Mobile acts as a transmitter and Bluetooth module as a receiver which is interfaced to the microcontroller and connected to the induction motor with controlling and other switching electronic devices depending upon various purposes.

Keywords: MIT App Inventor, Android OS, Smartphone, Bluetooth, Induction motor, Motor Control APP.

I. INTRODUCTION

Automation using smart phone is an emerging concept that attracts the synergy of several areas of information technology and engineering field. A lot of researches have been going on in the recent years to increase the use of smart phone in controlling various equipment. According to the studies, around 75% of electrical machines comprises of motors which makes the importance of electrical industries.
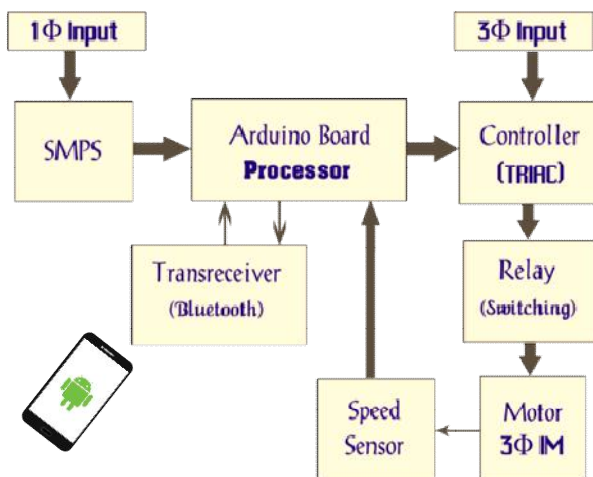
Smart Phone Remote

Fig. 1.1 Block Diagram

This system makes the use of smart phone for the efficient and effective control which provides user friendly interface controlling the various operations of electrical machines. The induction motors are widely used in numerous domestic and industrial applications. So, they are called as the workhouse of the motion industry. It is important to control the speed of induction motors for efficient control strategies and for reducing operation cost. Here, the speed is controlled with the help of android application. Android is an open source mobile operating system (OS) designed for touch screen mobile devices such as smart phones and tablets. In this project, Android mobile is used as a remote controller.

II. WORKING

Android mobile acts as a transmitter and Arduino act as a receiver. Bluetooth interface is used to send and receive data. Since, the load is connected in series with TRIAC, it is controlled based on the received signal and the speed control of induction motor is achieved.
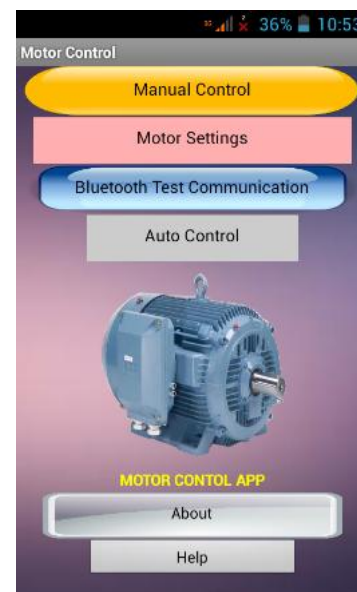

Fig. 2.1 Android app Main activity page

To improve the quality of the product, many industrial applications require adjustable speed and constant speed. Due to rapid and continuous advancement in automation process various remote control techniques have been

involved. In recent technology various alternate techniques are available for the different speed operation.

Here, the signal to the motor is initiated by the android APP from the mobile. The signal is transmitted over Bluetooth interfaced with Arduino Board. The Arduino board is connected with induction motor through control and switching circuits thus the control of motor is achieved.
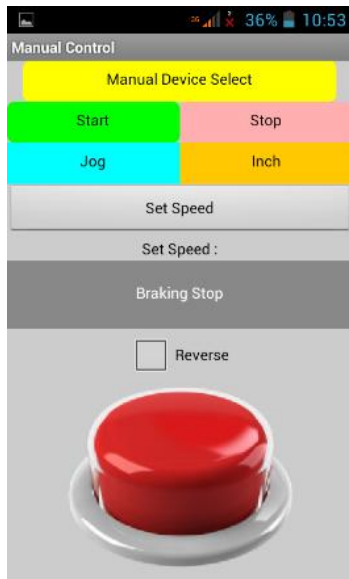

Fig. 2.2Android app Manual activity page

Above figures show the screen shot of motor controlled app developed by using MIT App inventor, Fig2.2 show the manual control of the Induction motor.

III. SOFTWARE

For this project, MIT App Inventor is used which is the latest app development tool for the android devices. (The android apps are generally developed using JAVA language). The "MOTOR CONTROL" App consists of five buttons and each button has different control bytes which are transmitted over Bluetooth for processing. The app consists of options in the main menu as shown in Fig 2.1. This app searches the Bluetooth devices along with their MAC addresses which is connected with the machine. The user has to select the particular MAC address. When a particular MAC address is selected, the status is shown on the screen is "Connected". Now the app is connected and various operations of machine can be controlled.

It does not require the prior knowledge of software language to write the coding. It is an open-source web application for android app development. It allows the user to create a computer logical programming for developing Android application. It uses graphical interface which allows the user

to drag-and-drop visual objects to create an application that runs on Android devices. The App consists of blocks which are used to build various coding for the app development.

IV. ARDUINO

Arduino is a fast developing open-source platform which has all the interfaces that can be possessed easily. It has both a physical programmable circuit board which is a and an Integrated Development Environment for writing software on the board. It is used to develop interactive objects, taking inputs from various switches or sensors and controlling the motors and other physical outputs. It provides a standard form factor that breaks the functions of the microcontroller into a many accessible packages. It simplifies the process of working with microcontrollers but also has an advantage of clear programming. Arduino UNO is a microcontroller board which has 14 digital input/output pins of which 6 pins are used as a PWM outputs, 6 analog inputs, 16 MHz of clock speed, USB connection, and reset Button. It contains everything needed to support a microcontroller and connect UNO to computer via USB cable or power it with dc adaptor to get started.

V. BLUETOOTH

Bluetooth is one of the best ways for wireless communication. Bluetooth receives data serially in RS 232 format. We need to build a circuit because Bluetooth understands data in RS 232 standard and Arduino controller understands Data in TTL format. So we choose Bluetooth module with TTL Logic - Bluetooth HC-05.

Bluetooth is a technology for wireless communication. Bluetooth divides transmitted data into packets, and transmits each packet into 79 designated Bluetooth channels. Each channel has a bandwidth of 1 MHz the connection can be of point-to-point or multi point where it can be extended up to   10 meters. The transfer rate of the data is 1Mbps to 2Mbps.

VI. SPEED CONTROLLING

The speed control system consists of Thyristor module with PWM Triggering. The mobile device transmits the input control signals command by the Bluetooth module so that it can be varied by the gate triggering as well as the commands at various speeds.   IDE displays the control system identification of the input signal. If falling edge and raising edge are at the same point, then the input signal is TRIAC signal. If falling edge and raising edge are at different points, then the input signal is PWM or analog signal. Again if

falling and raising edge are at same point, then the signal is the analog signal.

6.1 TRIAC TRIGGERING WITH PWM

One of the goals is to achieve the ability to control multiple electronic devices using the precise time signal generated by the RTC chip (bq3287). For electronic devices up to two amperes, a relay should be capable to handle the load and for high voltage and current home appliances such as water heaters, the relay becomes more expensive and less reliable. So, we turned to a solution of using an opto-coupler isolated TRIAC circuit. This circuit uses a BTA41 TRIAC as a main switching device. The opto-coupler is used to trigger the TRIAC in Semiconductor's MOC3061.

6.2 SPEED SENSOR

The speed can be measured using different kinds of sensors operating on various principles. A proximity sensor senses the presence of objects without any physical contact. The proximity sensor emits an electromagnetic field and changes the return signal. The object being sensed is referred as the proximity sensors target. For metal targets, an inductive proximity sensor is used. In this case, the speed of the rotating machine part (Shaft, Gears, and Cams, etc.) is monitored directly, so that special or additional sensing elements are not necessary. The measuring time depend upon the digital input pulse train. A non-contact proximity sensor provides the user to implement the encoders or tachometer generators. Since, the sensors are not in contact with the application, it can be easily replaced.

6.4 JOGGING AND INCHING

Jogging is the repeated starting and stopping of a motor in short bursts to perform a particular movement. This is usually done for positioning on equipment like conveyors or cranes to a particular location. The motor is operated on full power and a special Jogging circuits are also available. Inching is similar to Jogging and it involves short thrusts of motion at reduced power and the motor is made to run at reduced voltage. Jogging should not be done more than 5 times in a minute, because jogging can cause the motor to overheat. If Jogging is done frequently, the starter of the motor should be de-rated.

VII. HARDWARE

For hardware, Arduino UNO is used which is supported by Bluetooth module HC-05 and a switching circuits and timers. It is the main component which has digital outputs. It is an open-source board which can be programmed easily to get the desired output.

VIII. CONCLUSION

The objective of the project has been achieved by developing hardware and software for controlling the speed of the induction motor using Android application. It provides an easy and wireless control of the motor, thus reduces the wiring of the motor controlling circuit. It provides the use of existing Android mobile as a remote control unit of a motor by installing an android app.

IX. RESULT

The Motor control android APP is designed. The control signals are transmitted from the Smartphone and corresponding signals are received at the output terminals of Arduino board. Various signals are initiated and verified.
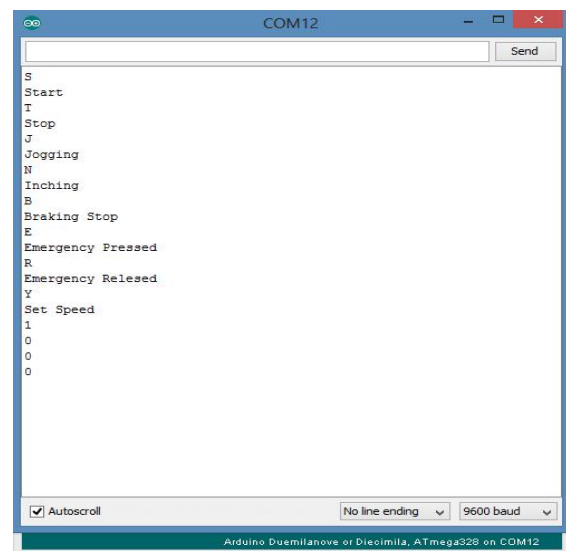

Fig. 9.1 Serial Monitor Received Control Signal

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