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SPECIALTY OS DEVELOPMENT FOR AIR TRAFFIC CONTROL

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Abstract: Automatic Advanced landing system is most essential and required for the most modern airports to reduce down time of activities and to improve quality air traffic. We would like to integrate the existing system, which is widespread in the airports today and leads to misguiding of aircrafts. We would like to present an economic affordable solution for perfect takeoff and landing system for airports with physical ambient conditions of the airport with audio visual networking. To have a reality demonstration of our idea, we have employed the state of art embedded controller technology along with associated hardware required for input an output. We would like to develop angular position of the aircraft from mid of runway, demonstration of diagonal antenna function, rotation technique of radars landing angle of an aircraft, ambient parameters like temperature, humidity, wind speed, wind direction and much more. A real time hand move model will be develop for this project.

Keywords: embedded controller, audio visual networking, .

I. INTRODUCTION

Partition OS to be developed to meet the speed of information sharing between various departments of Airports to be developed,Radar control,Climatology (Metrology),Ground support,Air Traffic Control.The above all to be connected on a single OS with informative and OS suitable for wireless transmission to be developed.GUI to be developed for better understanding.Voice over communication to be enabled b/w control room and Aircraft.

MOTIVATION: There are four networks involved in Air craft landing (ILS)- (Instrument landing system)

1. Metrology – Physical parameter
2. Radar – Flight position angle on sky
3. ATC – Analyzer and communication to Aircraft.
4. GSD – Runway, taxiway organization.

New all the above are located in different areas, that all to be formed as single os now to increase the speed on decision making, communication and to reduce network down time though various technologies introduced on the Air Traffic Control, that all involves many computers involvement. When for a single work, if many computer involves time delay cannot be removed. One new OS will solve these all issues.Issues/Dis-advantages:

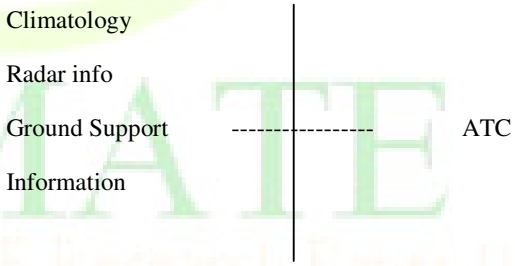
1.Network delay

2. Cabling issues

3. Delay due to multiple computer OS

4. Multiple GUI screen makes panic

The existing system have the following issues **PROPOSED**:Our proposed system is a single OS based system, that connects all the essential parameters on a single board computer and processed for high speed connectivity b/w the following.



Peripheral interface controller (PIC) is enhanced version of microcontroller. It is an ebeddded controller.PIC micro controller has the several advantages over microprocessor and personal computer, like fast data acquisition, compactness, accuracy. It has some inbuilt I/O ports to connect the peripheral devices like personal computer, ALS kit will be given as input to the personal computer and output of personal computer will be given as input to the ALS (some times it may not need) through PIC.

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Personal computer here used for monitor the data, which are all, acquired from ALS kit by PIC.

This is a serial port connector and voltage regulator. RS-232 converter used to make connection between PCand PIC and make voltage regulation between them (PIC: 5 volts, PC: 10 volts).

II. AIRCRAFT LAMDING SYSTEM COMPONENTS AND BLOCKS

Aircraft has three stages for every movement of upwards, downwards, and turn left and turn right. Totally it has twelve positions and also it has a lever to change the position of flight .Aircraft should be in pre-defined position while just before take-off and landing. If not it may have got any accident. So we have to find the position of lever. For this criterion we have put pull-up-resistors and both end in every position. 10 kohms resistor is used. It is used to verify the input of pre driver stage is low. When the IR detector is not conducting the collector to emitter is high. Now the input at pre driver (SL 100) may be high or low. But it should be low. To make it sure we are using pull down resistor.

Whenever the lever crosses over sensor, as soon as corresponding sensor will give the ouput(high), from this effect lever position has changed in monitoring system according to real time position of lever.

We are used thermistor to find atmospheric temperature and humidity, they converts temperature into Mill Volts. With these values, we are converting into degree celcius by manual calculation. For Humidity, on thermistor is inserted into water, & other. Thermistor is kept in room so that to sense & display room temperature. The formula for Humidity is

Humidity= T water/ T room * 100%

In this project wind direction just like that simulation. Normally the window direction can be measured by using switches. Wind speed measured by fan. For Fog & Visibility, IR sensors are used. IR sensors consists of IR emitter, and IR detector. Positive voltage is given to IR emitter. Using this voltage, it transmits IR rays continuosly & detector, the amount of rays that is collected by detector will be reduced depends on the obstacle.

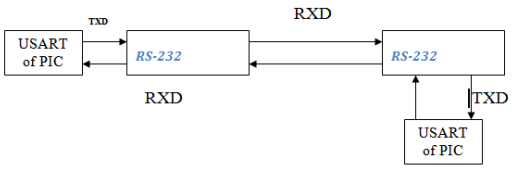

Figure 1: RS-232 Converter

III. THERMISTOR

In industry various types of temperature detection are available, like thermocouple, RTD'S and thermistors. Each of these sensors having some unique characteristics based on the applications and differs from one another. When we use thermocouple which is based on "SEE BECK EFFECT' required a cold junction compensation, which is expensive process and have poor linearity. The next expensive because this is made up of platinum. The third one and implemented in our project called THERMISTOR which comes under passive transducer classification. Thermistor finds wide applications and advantages. Here we mention some of it 1. Fast response 2. Smaller in size 3. Rugged 4. Good sensitivity 5.low cost. A thermistor is a ceramic semiconductor, which exhibits a large change in resistance with a change in its body temperature. The word thermistor is actually a contraction of the words "THERMAL RESISTOR". Although there are both positive coefficient (PTC) and negative coefficient (NTC) are available, for our application we use negative coefficient (NTC) type thermistor. These NTC thermistors are composing of oxides such as the oxides of the MANGANESE, NICKEL, COBALT, COPPER, IRON and TITANIUM.

The thermistors have much better sensitivity than RTD'S and are therefore better suited for precision temperature measurements. The availability of high resistance values allows the thermistors to be used with long extension leads, since the lead resistance or contact resistance effects can be greatly diminished. The non-linearity of the thermistor resistance-temperature characteristics outs a practical limit on the temperature span over which a thermistor can be operated in measurement or control circuit. RTD's have lower sensitivity and are more linear and can therefore be used in applications, where the

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temperature spans are very wide. Thermistors has other important advantages over RTD's in that they are available in smaller sizes, with faster response times, at lower costs and with greater resistance to shock and vibration effects.

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Vd = {V/(R1+R2)}*R2

Apart from this we have a specification chart of the thermistors.

For room temperature R = 800 ohms

For 50øC temp. R = 650 ohms

For 100øC temp. R = 500 ohms

For 150øC temp. R = 350 ohms

For 200øC temp. R = 200 ohms

For 225øC temp R = 125 ohms

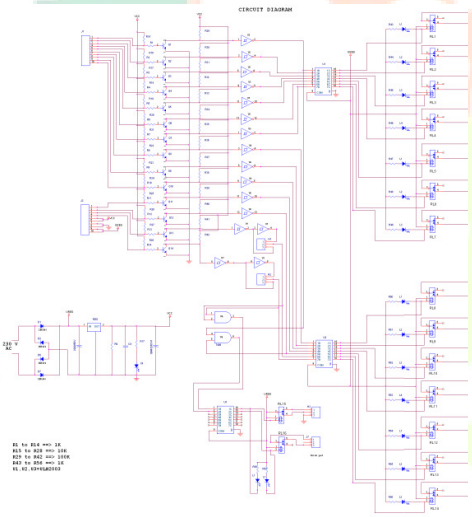

Figure 2: circuit diagram

Bridge rectifier can be used to convert AC to DC.but a single conducting diode drops the voltage of 0.6V. During each cycle, 2diode are in conduction mode.

So, totally 1.2V is dropped across it. This is undesirable because the voltage i.e., to be measured is about 5V We have used 1K resister from 5V dc to the IR emitter to restrict current flow beyond 5mA.That resistor connected to base of the BC107 resistor Even though IR emitter can withstand up to 35mA,We have used 5mA due to shortest distance .If the distance is more, We have to increase the current flow to the emitter, When a forward Bias current flows through the emitter, P-N junction photons are emitted .The total output power is a function of the forward current and is measured in mW. IR emitter emits the ray and IR detector detects the signal. It is having reverse character is this of the IR emitter. That is we cannot consume more current from it on account of positive sensitivity .For the above grounds we have used 100K from the supply voltage .So the sink current will be as per the ohms law I=V/R.So 5V/100K will be less they a micro amphene. Which may improve the detecting character is this .IR detector will conduct as long as the ray's falls on it. So the level will be low which may goes to cut off range, whenever there is no ray. Status will be high from the above me are clearly known that if there is no entry signal voltage will be low, If there is entry signal voltage will be high.

IR detector drives a NPN transistor, which provides inverse output at collector end and given to a two stages Schmitt trigger. Schmitt trigger performs the logic invert function. So the collector output is low the signal output of Schmitt trigger will be high. That output passing through the ULN2003 IC.This IC using for relay drive at that time the coil will be energy used, So the relay contact will be changed to Normally open and corresponding LED will be glow. The above same operations have done to other relays. The signal passing through transmitter. The Transmitter transmits the signal to receiver section. The receiver receives the signal, that signal going to P/C.Then the output is monitored in system.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

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Revision 3 of the board has the following new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

Microcontroller	ATmega328
Architecture	AVR
Operating Voltage	5 V
Flash memory	32 KB of which 0.5 KB used by bootloader
SRAM	2 KB
Clock Speed	16 MHz
Analog I/O Pins	6
EEPROM	1 KB
DC Current per I/O Pins	40 mA on I/O Pins; 50 mA on 3,3 V Pin

GENERAL

Input Voltage	7-12 V
Digital I/O Pins	20 (of wich 6 provide PWM output)
PWM Output	6
PCB Size	53.4 x 68.6 mm
Weight	25 g
Product Code	A000066 (TH); A000073 (SMD)

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.
- 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.
- IOREF. This pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs for working with the 5V or 3.3V.

IV MICROPROCESSOR AND MICROCONTROLLER

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB

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of EEPROM (which can be read and written with the EEPROM library).

INPUT AND OUTPUT

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off. The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference() function. Additionally, some pins have specialized functionality:
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library. There are a couple of other pins on the board:
- AREF. Reference voltage for the analog inputs. Used with analogReference().
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

COMMUNICATION

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A SoftwareSerial library allows for serial communication on any of the Uno's digital pins.

The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; For SPI communication, use the SPI library.

PROGRAMMING

The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board

The ATmega328 on the Arduino Uno comes preburned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.

You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP or similar.

The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU bootloader, which can be activated by:

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- On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.
- On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac external programmer (overwriting the DFU bootloader).

V PHYSICAL CHARACTERISTICS

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Four screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100 mil spacing of the other pins.

RELAY:

Relays are electromagnetic switches used as protective devices, indicating devices and as transmitting devices. Protective relay protect good component from the effects of the circuit components that have failed. Transmission relay are used in communication systems. Indicating relay may be used to identify a component, which has failed. Transmission relay may be used to identify a component, which has failed.

The relay is one of the most widely used components in industrial electronic. In combination with transistors, electron tubes and other circuit elements, this electromagnetic device performs countless tasks. Relays are electro magnetically operated remote controlled switches with one or more sets of contacts. When energized, the relay operates to open or close its contacts or to open some contacts and close others. Contacts, which are opened when energized, are called “Normally open”

(NO) or simply open contacts. Contacts, which are closed when energized, are called “Normally closed” (NC) or simply open contacts. Normally open contacts are referred to as “a” contacts. Normally closed contacts are sometimes referred to as “b” contacts.

There are certain terms associated with relays. The relay is said to “pick up” when it is energized and trips, and this “pick up” value is the smallest value of the fluctuating current required to close “a” contact or open “b” contact or closing “b” contact is said to “reset” or “dropout”.

Relay contacts are held in their normal position by either springs or by some gravity-activated mechanism. An adjustment or adjustments are usually provided to set the restraining force to cause the relay to operate within predetermined conditions.

Relay operates on one of the two different principles namely ‘electromagnetic attraction’ or ‘electromagnetic induction’. Electromagnetic attraction type relays, which may either be AC or DC actuated, consists of an electromagnet having a core and winding.

The core, the armature and plunger are made of magnetic material such as iron, silicon steel, or perrnalloy (an alloy of nickel and steel). The arrangement of parts in an attraction armature type relay as shown in fig 2. Connections to the winding of the electromagnet are brought to terminals 1 and 2.The movable contact is fixed on the armature. A spring, whose tension is adjustable, retains the armature from closing the gap between the stationary and movable contact.

Fog means snow falling and its density. There is any snow falling, Flight’s path isn’t clear, so flight’s path is changed to wrong way. Because it must to measure, IR sensors are used to this measuring, IR Emitter emits the rays and detectors receives the same rays, so it is detected and sensed .IR emitter and detector is arranged opposite direction to each other. When the rays are blocked, at that time the sensors are sensed. Suppose the fog is in-between of the IR sensor it blocks the rays. Thus the fog is measured useful on the monitored.

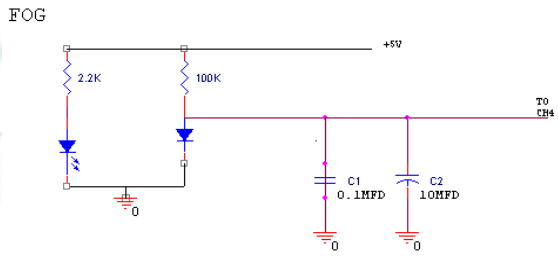

Figure 3 : fog

It is one of the parameter in the system. This is thing to pilot .It describes the pilots vision, that is how far his vision is clear. Here is also IR sensors are used to

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find the visibility. IR emitter emits the ray that goes in straight line and it is knocked at clouds then the rays are reflected. This reflected the IR detector receives rays. The distance is long the visibility is cleared but the distance is short the reflected rays are quickly received by detected so the visibility is not clear.

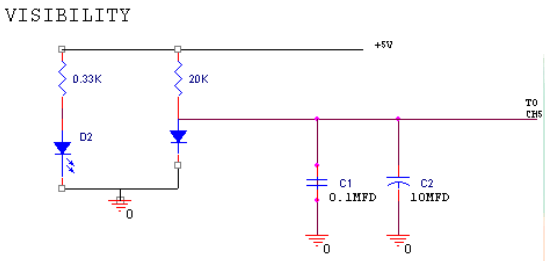

Figure 4: visibility

It is used for wind speed. Wind speed is measured by the rotation of the fan. When fan is rotated, the voltage is varied, that varying voltage is displayed which as like that speed of wind.

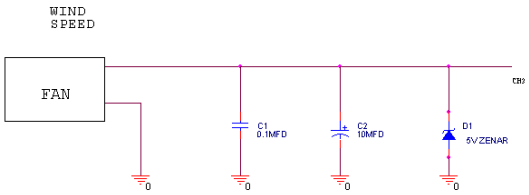

Figure 5: wind speed

This circuit is used for wind direction .In this project wind direction just like that simulation. Actually this switching operation is low to high transaction. Switching output is connected to PIC and initially output is low when switch is operated, its output is changed low state into high state. Then the output is monitored in PC.

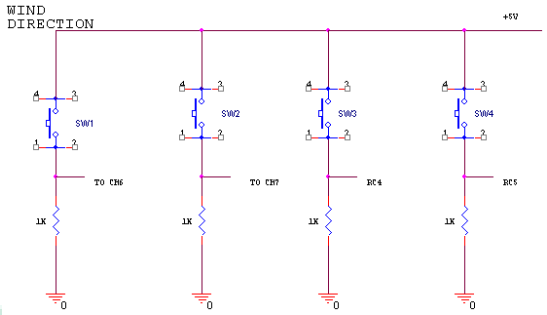

Figure 6: wind direction

VI RESULT ANALYSIS USING VISUAL BASIC

. The Microsoft VB programming system for windows is an exciting advance for anyone who is involved in writing window base applications. With this event driven programming engine and innovative, easy to use visual design tools, VB lets you take full advantage of the window graphical environment to built powerful application quickly.

As more people began to use computers the isotonic and complicated languages used for programming became more of an obstacle. A language called BASIC was developed to counteract this. Its simplicity made it easy for the users to write amazing programs.

Over the years this programming language was enhanced and developed. The demand for faster, simpler, smaller and easy to use software led to the development of Microsoft quick Base. This was in line with the programming language technology of the 1980's but an even bigger change was on the horizon namely, graphical user interface (GUI).

With the advent of windows, users are able to work in a graphically rich environment.This made application much easier to learn and use. It also facilitated the use of multiple windows on the screen enabling to run more than one program at a time.

Although this environment was like a boon to the user, life was suddenly a lot together for programmers. A simple program to display a message on the screen, which could be written in four lines in MSDOS, now, ran to two or three pages.

PROGRAMMING FOR WINDOW WITH VB:

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The VB programming system packages up the complexity of windows in a truly amazing way. It provides simplicity and ease of use without sacrificing performance or the graphical features that make window such a pleasant environment to work in Menus, fonts, dialog, boxes etc are easily designed and these features require no more than a few lines of programming to control.

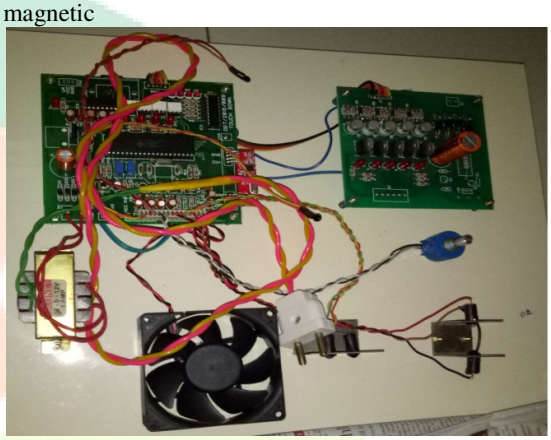
It is one of the first languages to support event driven programming a style of program especially suited to graphical user interface. The aim in modern computer application is to have the user in charge.Instead of writing a program that plots out every step in precise order, the programmer writes a program that responds the users action like choosing a command, moving the mouse etc. Instead of writing on large program, the programmer creates an application, which is a collection of cooperating many programs. With VB such an application can be written with unprecedented speed and case.

This project has been done with a virtual view of the traction of the train. It represents the animated view of the moving train with boogies with the multimedia effects etc.

FEATURES:

- Improved performance
- A data base creation tool
- Visual data access with the data control so that it is possible to create data browsing application without writing code.
- A new OLE (object linking and embedding) control that allows in place editing.
- A collection of common dialog boxes that streamline common user interface tasks.
- The ability to create pop-up menus anywhere in the application.

The relay shown as normally open contact (4 & 3) and contact 4 & 5 are normally closed. Connections to the two contacts are made at terminal 3 and 4 of the relays, when they energize. When terminals 1 and 2 are connected to a source of electric current, an electromagnet is formed, and the armature is attracted to the core. If there is sufficient current to overcome the restraining force of the spring the relay contacts close. The armature will be attracted whether the pole of the electromagnet adjacent to the armature is the North or South. Therefore, the energizing current for the electromagnet can be either direct or alternating. However, an AC attraction type relay from a DC relay in that it has a shading ring, whereas the DC relay does not. The shading ring is a non-magnetic device which is inserted in to a slot cut in the coil and minimizes the tendency of the relay contacts to chatter under the influence of the alternating magnetic



field.

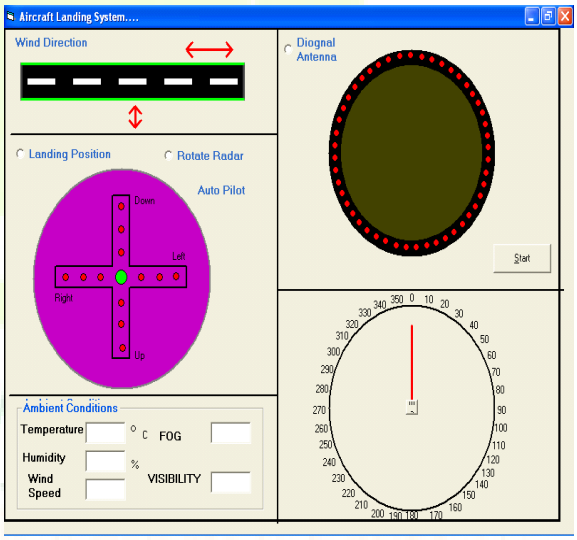


Figure 7: aircraft landing system

CONCLUSION

The project titled **"Advanced landing System"** helps **A**ir **T**raffic **S**ervices **[ATS]** for controlling smooth Take-off and Landing of many aircrafts in the airport. With the help of monitoring ambient parameters like temperature, humidity, wind speed &its Direction, can avoid confusion in arrival

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& departure of the aircrafts. There might be a chance of accident due to abnormal position of flight during landing. By checking the position of Lever, the chance of accident (caused by pilot fault) can be reduced. Integration of these monitoring systems reduces time consumption and increases the flow of air traffic. By using this project, **ATS** can monitor and control the air-traffic more efficiently.

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