A NOVEL APPROACH FOR REAL TIME ESTIMATION OF WIND POWER RESOURCES

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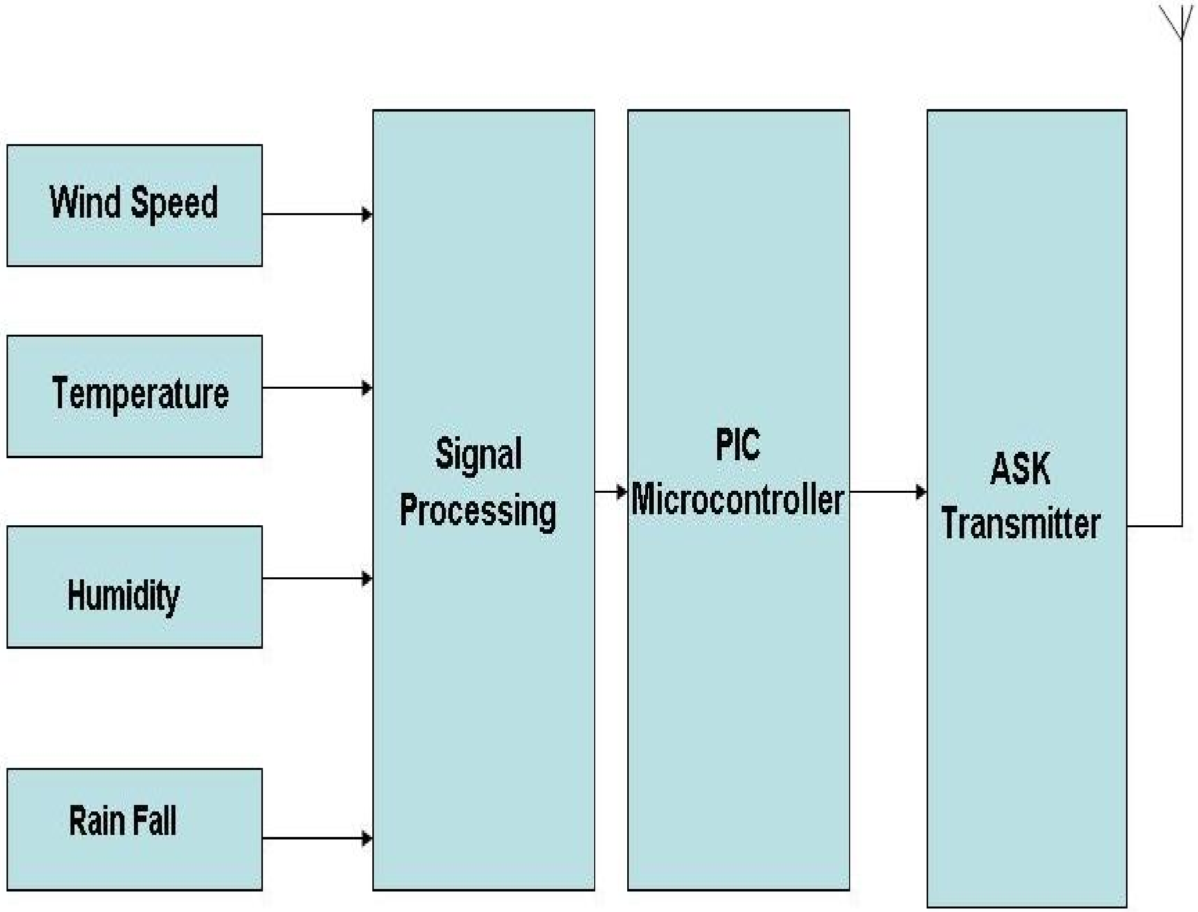
Data Acqisition Unit

Data Acquisition Unit consists of:

- Wind Speed Sensor
- Temperature Sensor
- Humidity Sensor
- Rain Fall Sensor



Block Diagram of Transmitter Section

Sensors

Wind Speed Sensor: Sonic Anemometer- HS50(sampling rate=50Hz)

Temperature sensor: LM 35

Sensitivity: 10mV/C

range: -20C(-200mV) to 70C (700mV)

Humidity Sensor: SYHS 220

Range: 10% of RH (Relative Humidity) to 20% RH

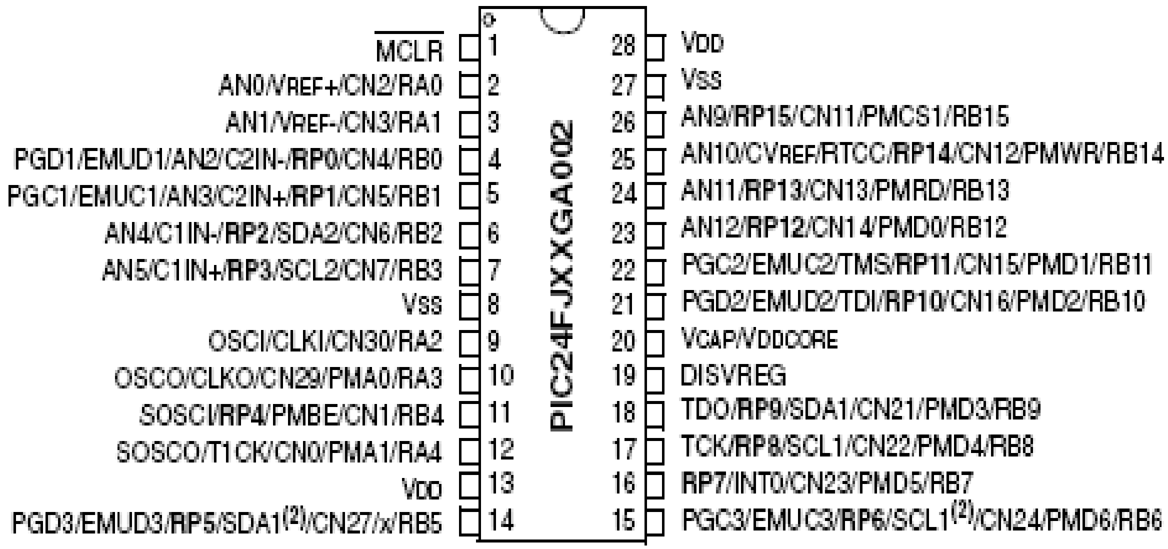
Rainfall Sensor: Geiger Muller Tube

PIC microcontroller

PIC is a family of Harvard Architecture Microcontroller made by Microchip Technology. It is referred as "**Programmable Interface Controller** (or) Programmable **Intelligent Computer**

We have used PIC24FJ64GA004 Microcontroller.

28-Pin SPDIP, SSOP, SOIC(1)



ASK Transmitter

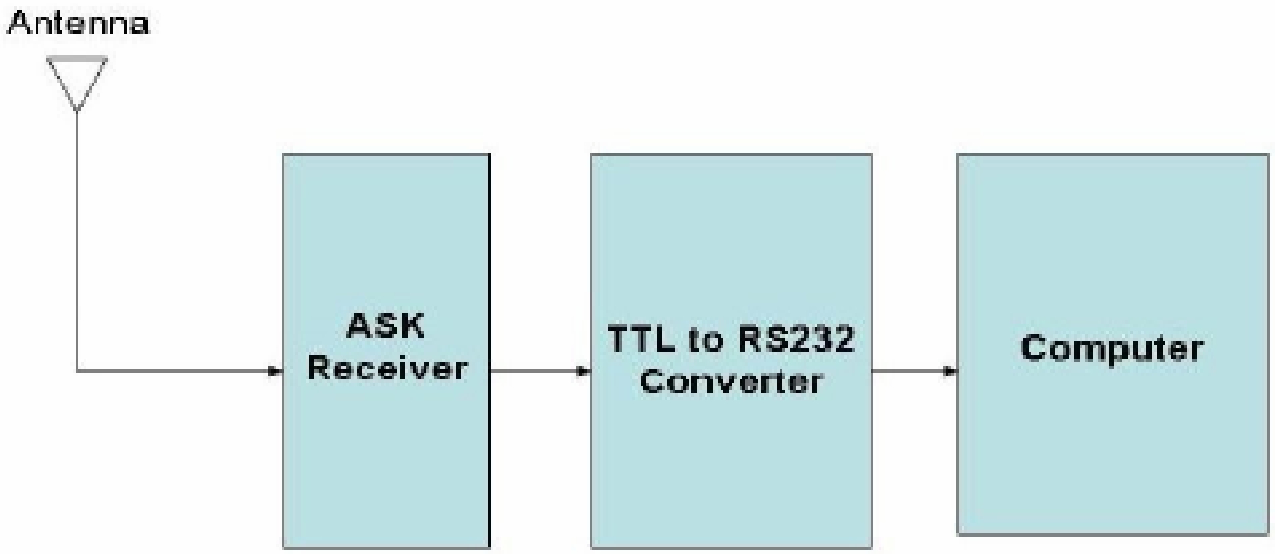
The MAX1472 is a crystal-referenced phase-locked loop (PLL) VHF/UHF transmitter designed to transmit OOK/ASK data in the 300MHz to 450MHz frequency range. The MAX1472 supports data rates up to 100kbps, and adjustable output power to more than +10dBm into a 50Ω load.

Receiver Section

Receiver consists of the following:

- ASK Receiver
- TTL to RS232 Converter
- Personal Computer

Block Diagram of Receiver Section



ASK Receiver:

Freq: 434 MHz

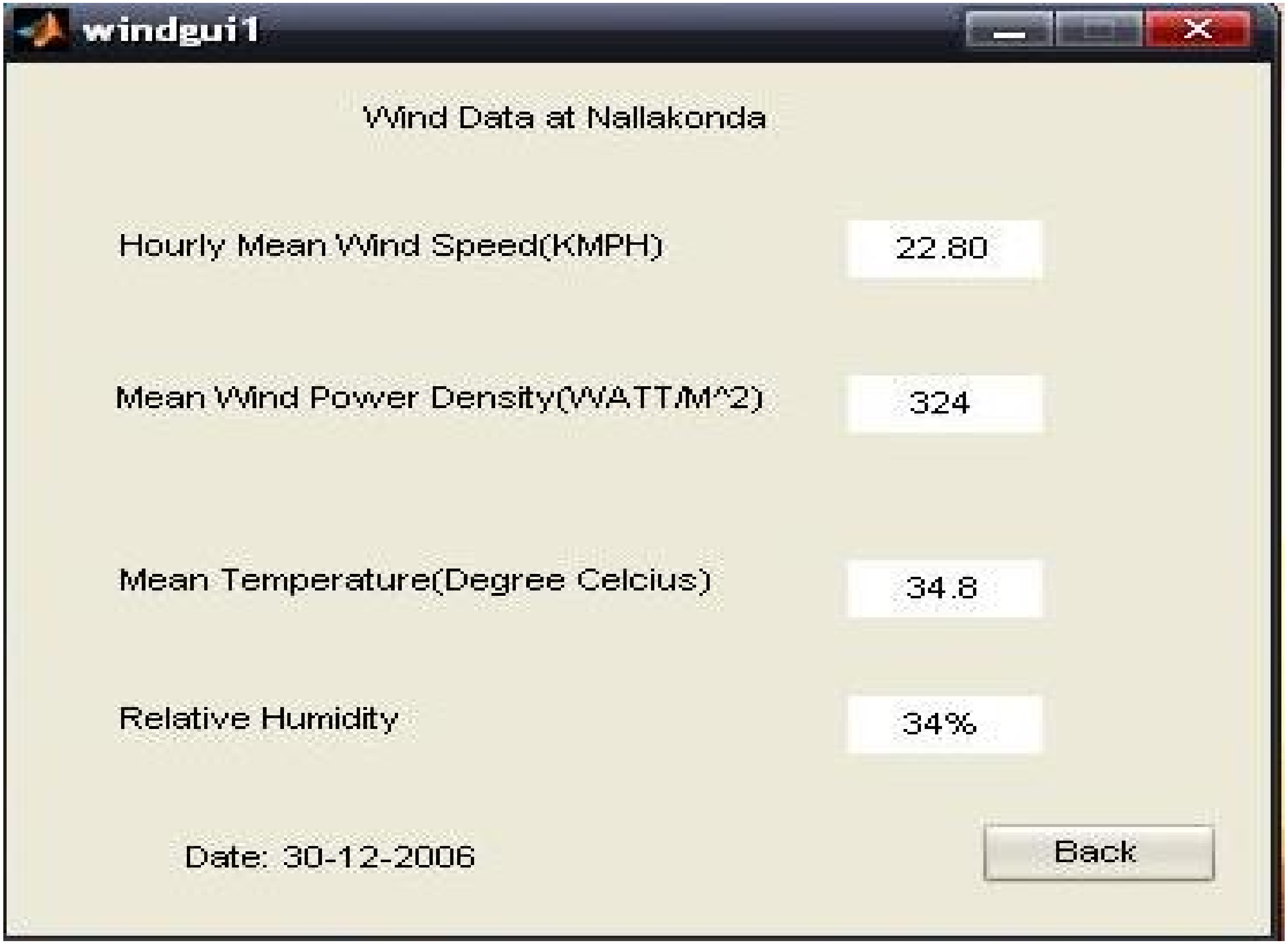
Power supply:+5V/500mA

Prediction of Site

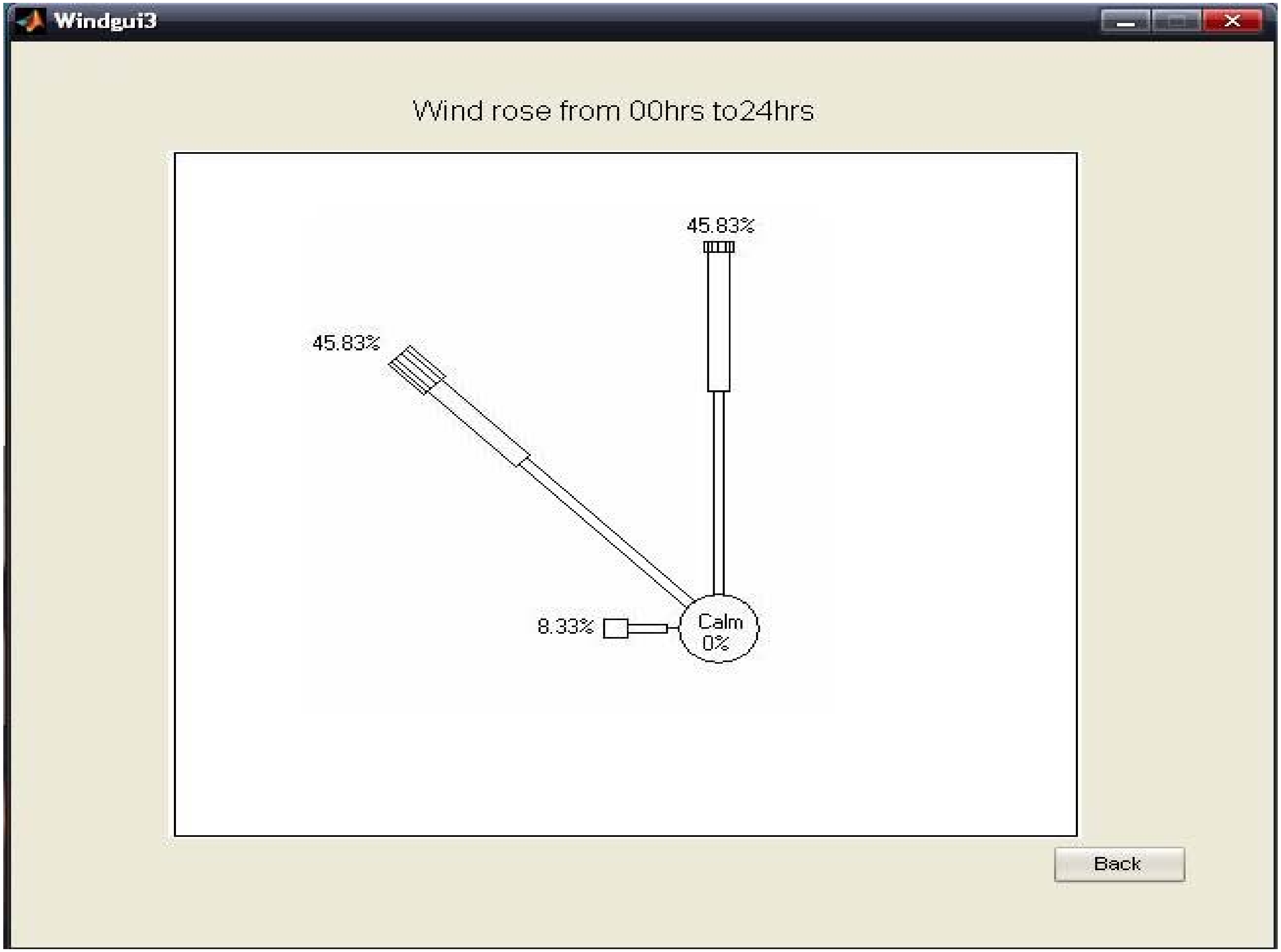
- The Personal Computer consists of a GUI, Which Displays all the sensed parameters.
- From the sensed parameters, wind rose, frequency of wind distribution and power density profile of the site are estimated.
- The estimated parameters are compared with the ideal conditions. And based on the analysis made, the site is selected for the erection

Basic Panel of GUI

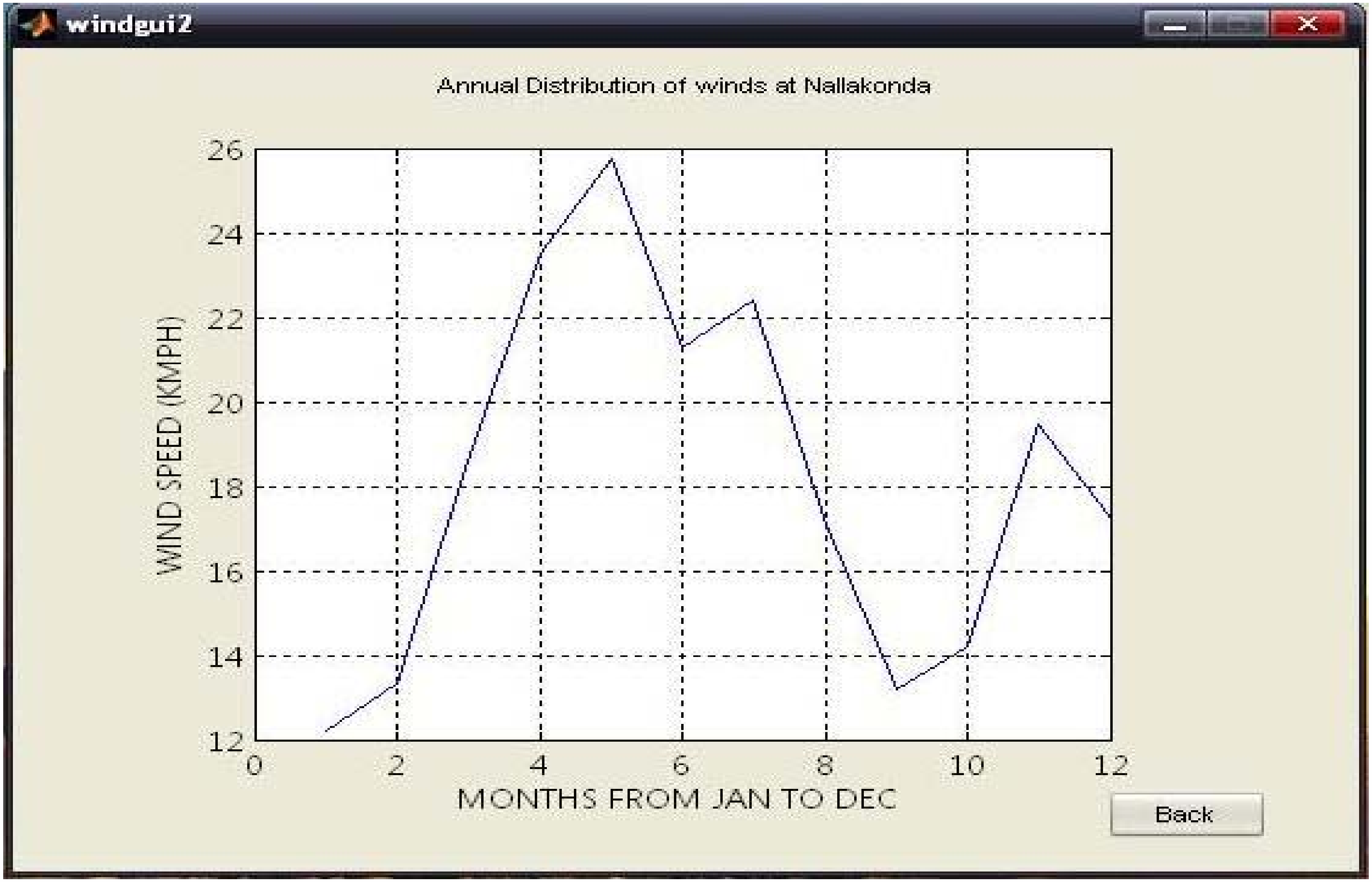
GUI Displaying Data of a Site



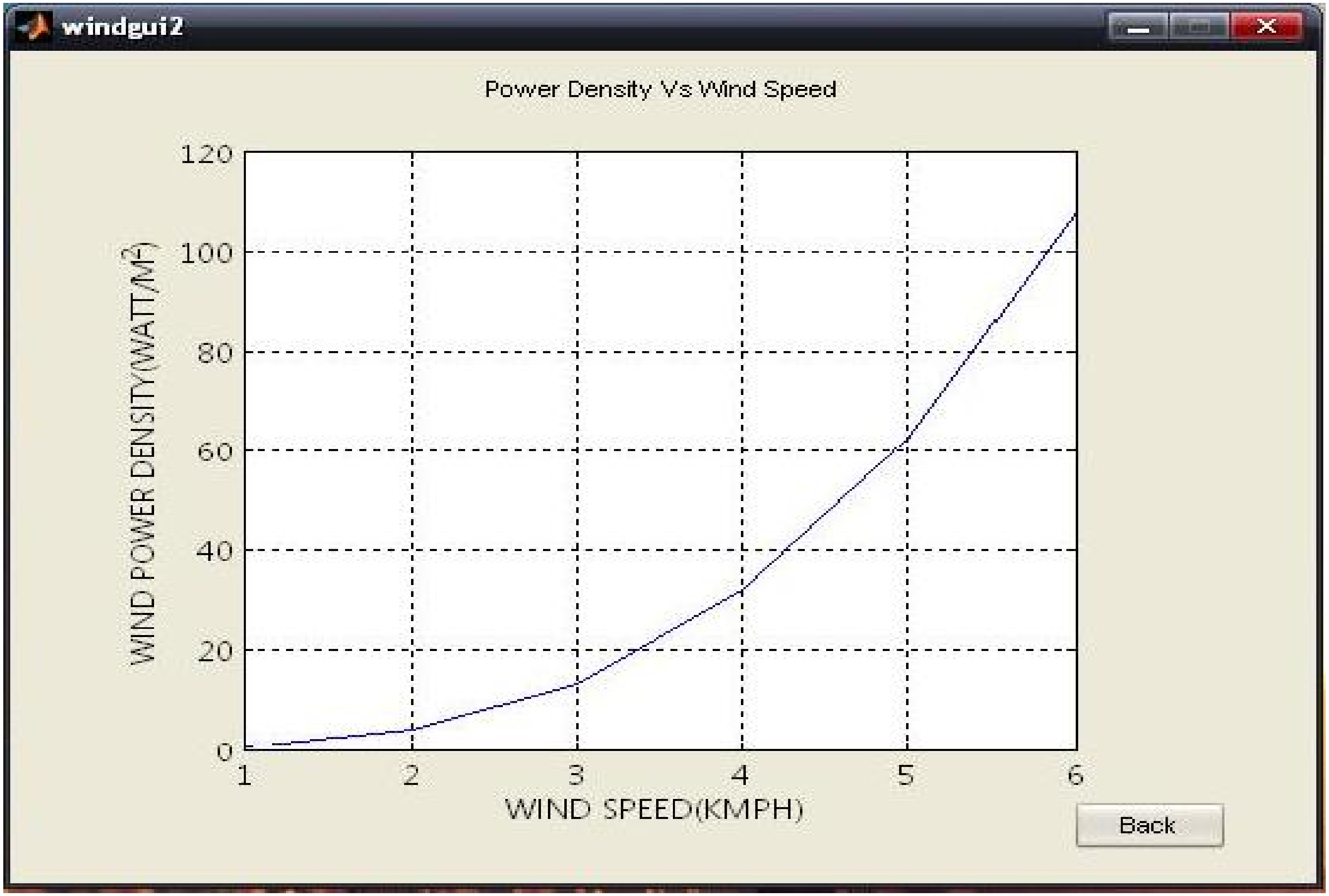
GUI Showing Wind Rose



Monthly variation of Wind Speed at the selected site



Wind Power Profile at unity Pitch



Forecasting Of Wind Power at the site after Erection of the Plant

- The wind forecasting techniques proposed so far have mostly used velocity of wind as the only input with no other constrains.
- A relation has been established considering all the constrains other than wind velocity which could predict the power output more accurately.
- The established relation is used in a predictive algorithm, to predict the possible power output for next 24hours.
- Predicting the power output in advance enables us to schedule the load economically.

$$\text{Total Power} = gr.\ n\ .\ 1 \int_0^R \tfrac{1}{2} w\rho V^3 \cos\varphi \, dx \,]\, c_c c_y$$

$n \rightarrow$ No. of Blades , gr– Gear ratio

$R \rightarrow$ Length of each blade

$w \rightarrow$ width of the blade

$\rho \rightarrow$ Density of air

$\Phi \rightarrow$ Pitch angle

$C_c \rightarrow$ Cut out factor

= 0 when speed < Cut in speed (or)

speed > Cut out speed (or) at squall

= 1 (under normal operating conditions)

$C_y \rightarrow$ Yaw orientation Factor

= $\sin\theta$ (For yaw fixed)

Where θ= Angle between blade and wind velocity

C_y= 1 for yaw active

$\acute{\eta} \rightarrow$ Efficiency of wind turbine

Conclusion

In this paper we have discussed On Line model for estimation of suitable site for erection of the Wind Turbine. A new model for estimating the power output in advance is formulated considering all the constrains.

Thank you

The PIC architecture is distinctively minimalist. It is characterized by the following features:

separate code and data spaces (Harvard architecture)

a small number of fixed length instructions

most instructions are single cycle execution (4 clock cycles), with single delay cycles upon branches and skips

a single accumulator (W), the use of which (as source operand) is implied (ie is not encoded in the opcode)

All RAM locations function as registers as both source and/or destination of math and other functions.[1]

a hardware stack for storing return addresses

a fairly small amount of addressable data space (typically 256 bytes), extended through banking

data space mapped CPU, port, and peripheral registers

the program counter is also mapped into the data space and writable (this is used to implement indirect jumps)