Prototype of decision support system for wind detection based on optocoupler and magnetic sensor

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Abstract. Measurement of wind speed and direction can be done by observation using an anemometer, but the results sometimes are not accurate. The research aims to design a prototype decision support system based on an optocoupler and magnetic sensor for wind detection that works automatically detects wind. The software development model used is the Prototype Model. This study aims to design measurement of speed and wind direction and the information produced can be used for decision support systems as a reference for determining the timing of fishing for fisherman and mapping the potential of wind energy in an area.

1. Introduction

Wind speed is the movement or distance of wind/air per unit time. Wind speed is usually measured in units of knots or km / hour (1 knot is equivalent to 1.854 km / h = 0.5148 m / sec) [1,2]. Measurement of wind speed and direction is generally carried out through observation with the help of a tool called anemometer, but the facts in the field sometimes detect wind speed and direction are not accurate [3,4]. There are several alternatives to detect windiness, and wind direction, one of them is by using microcontroller-based technology [5], by using a device prototype to detect speed and wind direction that uses a magnetic field sensor and optocoupler that can be used to determine the speed and wind direction in a region automatically and real time.

The sensor for detecting speed and wind direction that is applied for measuring wind speed is an optocoupler sensor which is assisted by a hollow sensor plate and a sensor used to show the direction of the wind using a light sensor system and three bowls as a propeller, with the help of sensor disks to help read when low and high state sensors with the Arduino microcontroller as the data management centre and the results will be displayed on LCD [6–8]. In this study, we will design wind speed and direction measuring devices based on the Arduino microcontroller using the Arduino board module, optocoupler, and LCD module. The tool designed can record wind speed and wind direction data in real time, and the results are stored on the system and displayed on the LCD screen. The information produced can be used for decision support systems [9,10], as a reference for mapping the potential of wind energy in an area and determining the timing of fishing for fisherman. This study aims to design measurement of speed and wind direction so that fishing activities in the sea in safety and security are very much considered, and connect software and hardware designed to produce precise and accurate measurements of speed and wind direction.
2. Method
The system development methodology used is the Prototype Model [11], with stages:

- Communication, determine system requirements in designing a detector for wind speed and wind direction to be made.
- Quick Plan, design plan, and block diagram are made for hardware components.
- Modelling Quick Design, making a sketch/design consisting of a simulator design to detect wind speed and wind direction, design hardware, and software.
- Construction of Prototype, the assembly of hardware components are assembled by the prototype tool to detect the speed and direction of the wind; then the hardware components are connected to the software that has been made.
- Deployment, Delivery, and Feedback, testing is carried out on the prototype of the detection device for the speed and direction of the wind that has been designed [12,13].

![Prototype model diagram](image)

Figure 1. Prototype model.

3. Result and discussion
3.1. Communication
The results of this stage are in determining the hardware and software requirements needed to design a detector for speed and wind direction:

- Optocoupler sensor functions as a sensor that can be used to determine speed and direction [7].
- Anemometer Cup used to measure wind speed [3].
- WindVane, serves as a determinant of wind direction [4].
- Liquid Crystal Display serves as a tool status marker and displays results [14].
- Arduino microcontroller serves as the main component that becomes the brain of the speed detection tool and wind blood [6].
- Magnetic Sensor functions as a sensor to determine with accurate the direction of the wind [15].
- USB cable serves to connect the Arduino microcontroller with a laptop [5].
• The Arduino software used is the driver and IDE. The program code (sketch) uses the C programming language [6].

3.2. Quick plan
At this stage, a design plan for detecting the speed and direction of the wind is carried out, namely by determining the block diagram as can be seen in Figure 2.

![Figure 2. Hardware circuit.](image)

3.3. Modelling quick design

![Figure 3. How the optocoupler sensor works.](image)

![Figure 4. How the magnetic field sensor works.](image)
3.4. Construction of prototype
At this stage, it is designed to detect wind speed and direction based on the design of a series of hardware and system flowcharts that have been arranged in the previous stages. The tools designed can be seen in Figure 5.

![Prototype Wind Detection Diagram](image.png)

**Figure 5.** Hardware specification for prototype wind detection.

3.5. Deployment, delivery, and feedback
Test simulations are carried out by placing a wind vane in a location when the wind blows, the propeller and anemometer rotate. Sensors contained in the anemometer are immediately active and provide information to the input interface module through processing in the optocoupler and magnetic sensor circuit.

4. Conclusions
The design of a prototype wind detection can be done by utilizing Arduino microcontroller technology. The tool designed to detect windiness on a scale of 1-20 Knots and can detect the direction of the eight directions. Where for the system works using optocoupler sensors and magnetic field sensors as input receivers. The output of a prototype wind detection is in the form of wind speed and direction displayed on the user interface (LCD). Information about wind speed and direction is useful as a decision support system to determine the right time for fishermen to carry out fishing activities and is also useful for detecting locations that have wind potential/mapping the potential of wind energy in the area.

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