THE DEVELOPMENT OF PARAGLIDING'S PILOT MONITORING SYSTEM AND WEATHER STATION BASED ON INTERNET OF THINGS (IOT) IN PARALAYANG GUNUNG PANTEN MAJALENGKA

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ABSTRACT

Mt. Panten Majalengka is an paragliding flight area. Paragliding is one of the branches of sport flying free. This sport very attentive to the weather and wind power. In area Paragliding Mt.Panten measurement weather conditions still using estimates from the pilot paragliding while the measurement of wind power using windsock. To find out the weather conditions and wind forces the pilot to come to your location. Paragliding Manager the trouble to give information to the pilot of the flight that was paragliding when pilots out of flight area. Pilots and paragliding Manager trouble getting location information a pilot when flying and weather information and the power of the wind. Internet of Thing (IoT) is a concept in which an object has the ability to transfer data over the network without requiring interaction human to human or human to computer. IOT could be utilized on a paragliding for paragliding pilots monitor flying and can be used to monitor weather station on the area of paragliding. The utilization of Global Position System (GPS) and the Google Maps API is used for paragliding pilots monitor who is doing the flight. In addition the manufacture of tool-based weather station IoT consisting of sensors-sensors and mikrokontroller. Monitoring System Pilot Paragliding and IoT-based weather stationis very ease pilot paragliding and hang gliding Mountain Manager Panten Majalengka.

Keyword: Monitoring, Weather Stations, Paragliding Pilots, Flight Internet of Things.

1. INTRODUCTION

Paragliding is pretty famous lately in Majalengka Regency since the opening of the tourist attractions in the region of the mountain paragliding Panten Southwest Majalengka or precisely in Munjul village. This tourist attraction was pioneered as early as 2010. Sights of Paragliding is supported by District Government of Majalengka. Paragliding Paragliding is sports or flying by using a parachute and landing using the feet.

Based on the results of the interview with Mr. Dede Sopyan speaker who manages the Mountain Paragliding Panten Disha and Dawn Prahani as athlete Paragliding Majalengka Regency, to conduct a flight at Mt. Panten is heavily dependent on weather conditions and the strength of the wind. Therefore, it must be able to read or predict the weather and wind forces. If one predicts, then it could be just having problems at the moment will be flying, it is potentially the occurrence of accidents. Weather information is very necessary because it can be used to reduce or even avoid the risk due to the bad weather the [1]. A tool for measuring wind direction used in hang gliding Mountain Panten still manual i.e. using windsock, windsock is a cone-shaped tool made from fabric that is tied up on a hanger and can spin according to the direction of the wind, this tool started to follow the strength and direction of wind [2]. Sometimes the windsock is not equiped for measuring wind speed (anemometer), wind speed can only be measured on the basis of the relative angle of the windsock pole against mounting [2]. If the wind speed is low then the windsock droops and the speed of the winds then windsock straight horizontally. Windsock gauge yet quite helpful to the smooth running of each pilot/athletes who deliberately came to enjoy the freefall rides. In addition the pilot never had a condition where when flying out of the area of the flight that caused the landing does not correspond to the landing point is already determined. It is caused due to the absence of a notification directly from the manager who oversees flight to pilots who were flying that he is still in the area of the flight or was out of the area.

In some of these problems then needed a concept in the creation of systems that can be implemented to meet the needs of pilots and maintainers in getting weather information as well as notifications about flight and area makes it easy for managers to monitor the pilot when making a flight. The concept of the Internet of Things to membanguan a weather station that can dimonitoring in realtime through the website or smartphone [1]. The Google Maps API is one of the features of the application issued by google to simplify users who want to integrate Google Maps into your website by displaying each data point have own [3]. Google Maps API utilizes a GPS (Global Positioning System) to perform tracking and delivery point

positions the user [3]. The concept of utilization of GPS on Smartphones and Google Maps API is a solution that can be used to monitor the location manager pilot was conducting the flight and the utilization of android smartphone to the notification area flights to the pilot.

Based on the background above, development Paragliding Pilot Monitoring System and weather station in Paralayang Gunung Panten Majalengka which can be accessed online as well as realtime as well as to facilitate athletes/pilot and tourists who want to try paragliding.

2. THE CORNERSTONE OF THE THEORY

2.1 Paralayang

Paragliding is one of the branches of sport flying free. Paragliding is defined as a parachute that can be deployed and can lift the body of the pilot. Parachute or aircraft used takeoff and landing using distance aviator, by taking off from a hill or a mountain slope by utilizing the direction and speed of wind [4].

2.2 Internet of Things (IoT)

According to the (Misalkar & Burange, 2015) the Internet of Things (IoT) is a structure in which an object, a person is provided with an exclusive identity and the ability to move data through another network without the need for two-way between human to human that is the source to purpose or human interaction to the computer.

2.3 Raspberry Pi

Raspberry Pi is a single board computer (Single Circuit Board/SBC) or mini computer which has the size of a credit card. Raspberry Pi is very useful for various purposes, such as spreadsheets, games, play high definition video. Raspberry Pi developed by Raspberry Pi Foundation managed developer and computer experts from the University of Cambridge, United Kingdom [5].

2.4 Sensor

The sensor is a device used to detect or measure natural events such as gas, heat, smoke and turn it into a representation of the value of the analog or digital depending on the type of sensor being used [6].

2.4.1 DHT11 Sensor

DHT11 is a temperature sensor that consists of a calibrated digital output module. The output of DHT11 is a digital signal so that to access it is necessary programming and not needed pengkondisi signals or ADC. To measure the humidity between 20% to 90% as well as the accuracy of 5% and temperature between 0 to 50°C with an accuracy of ± 2°C [7].

2.4.2 BM180 Sensor

Barometric pressure sensor is BMP180 and air temperature of Bosch Sensortec performing very high which can be applied on various devices [7].

2.5 Module

The module is an electronic circuit that has a specific function and can be connected to the Arduino to support certain functions in accordance with the requirements [7].

2.5.1 Windvane Module

Windvane modules or wind direction is a module that consists of 8 magnetic sensor and 8 digital outputs. to detect 8 wind direction: North, Northeast, East, Southeast, South, West, badat, Northwest When detecting sensors (logic 0), when the sensor does not detect (logic 1) [8].

2.5.2 Anemometer Module

The module is a module for the Anemometer measures the wind speed of the optical sensor that uses a type of slit. Sensors mounted on PVC pipe 1/2 dim and distance kincirnya from end to end 16 cm. overall Height 22 cm, with an output Pulse TTL digital [9].

2.6 Google Maps API

Google Maps is a free service from Google which is pretty cool. You can add a feature Google Maps in your own web with Google Maps API. The Google Maps API is a library of JavaScript. Using the Google Maps API or reprogrammed very easily. In need is knowledge of HTML and JavaScript, as well as an Internet connection [10].

3. DISCUSSION

3.1 Analysis System Built

Analsis of the system built, namely the stage gives an overview of the system to be built and aim to give a more detailed description of the workings of the system being built.

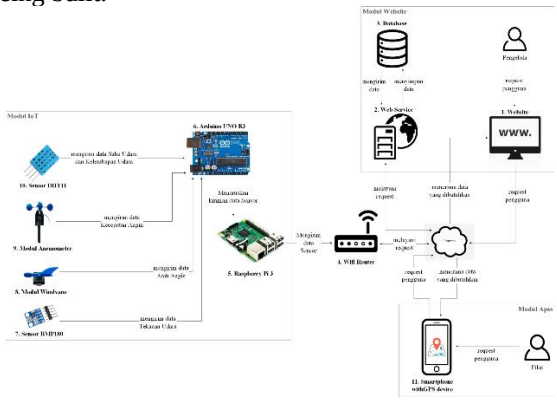

Figure 1. System Architecture To Be Built

The following is a description of the monitoring system architecture and paragliding pilots such as weather station Figure 1 as follows:

1. Stages of IoT module (Hardware)
   a. Sensors read data DHT11 air temperature and air humidity as well as sending the data to the arduino uno.
   b. BMP180 Sensors read data air pressure and transmit that data to the arduino uno.
   c. Module Anemometer wind speed data read and transmit that data to the arduino uno.
   d. Windvane Module read the wind direction data and sends that data to the arduino uno.
   e. the Arduino UNO as a mikrokontroller that takes the data from all the sensors and modules as well as the sender of the data to the raspeberry pi.
   f. Raspberry Pi 3 as a media recipient data from the arduino and the media as the sender of the data in JSON format to the web service through a wifi router that is connected to the internet.
2. Stages of Website modules (Manager)
   a. Managers access the website through the browser and login.
   b. the maintainer can see weather station data, manage pilot data, and view the location of the pilot who was conducting the flight.
   c. the Request will be sent to the web service through the internet network.
   d. Web service processes the request by accessing the data of database.
   e. Web services send the required data from the database to the maintainer with interface on the website.
3. Stages in module Apps (Pilot)
   a. Pilot access android application and login.
   b. the Pilot can see the data from the weather station and the pilot entry for login.
   c. the Request will be sent to the web service through the internet network.
   d. Web service processes the request by accessing the data in the database.
   e. Web services send the required data from the database to the maintainer in JSON format with an interface system in smartphone (android).

3.2 Analisis Komunikasi Data

Data communication is a very important thing, because of the absence of communication of data, an application that is built will not be able to walk properly or optimally. The following explanation of the 3 main elements part on data communication system as follows:

1. Data source
   BMP180 Sensor, DHT11 sensor, Sensor, Anemometer Module, module Windvane, a Smartphone with GPS, the Arduino UNO.
2. Transmission Media
   Raspberry Pi 3, WIFI Router, Web Service.
3. Recipient Data
   Website, Smartphone.

3.3 Work Analysis application system

Analysis of employment application system is divided into two, namely work analysis system provider of the website to monitor weather station and the location of the pilot who was conducting the flight and job analysis system android applications for pilot monitor weather station.

3.3.1 Website

The website was built using the framework laravel. Laravel was chosen because of the high security level of risk for a website and the source is pretty much on the internet is becoming the main points he chose Laravel as the application development framework monitoring monitoring pilot paragliding and weather station IoT-based. The website displays the monitoring pilot paragliding paragliding area maps, along with the form markernya and display the weather station with weather changes charts.

3.3.2 Android applications

Android applications built using the java language pemogrman. Android-based applications initi chosen because for every day use android pretty comfortable to use and with an attractive appearance and not boring. Android applications display only data weather station.

3.4 Functional needs analysis

Describe the process of functional needs analysis activities will be applied in the system and explains the requirements necessary in order that the system can work properly and in accordance with the system.

3.4.1 Use Case Diagram

Use Case Diagram is modeling for behavior (behavior) information system to be created, can be seen at Figure 2.

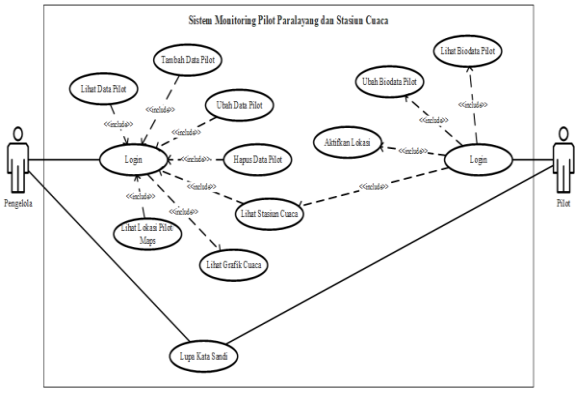

Figure 2. *Use Case Diagram*

3.4.2 Activity Diagram

Activity Diagram is a step that more focus to describe the business process and the sequence of events in a process, can be seen at Figure 3.

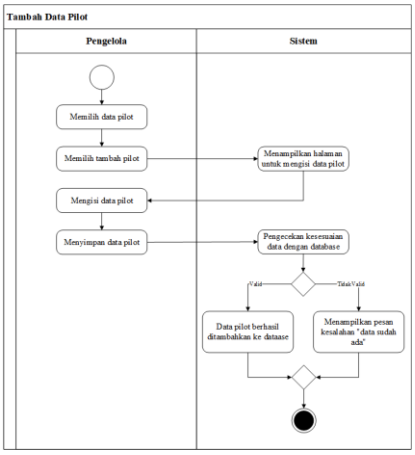

Figure 3. Activity Diagram Tambah Data Pilot

3.4.3 Class Diagram

The class Diagram is a specification of the functionality that generates objects and is the core of the development of these applications, can be seen at Figure 4.

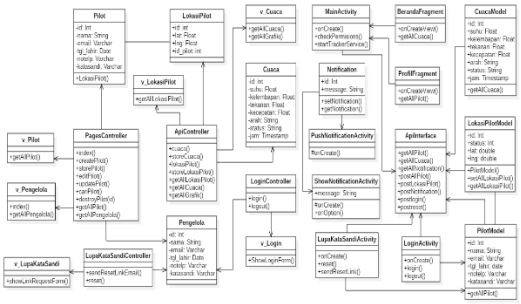

Figure 4. Class Diagram

3.4.4 Sequence Diagram

Sequence diagrams are made aiming to describe the interactions between object on the use case, we can see pada Figure 5.

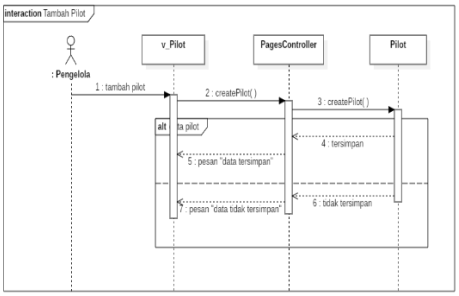

Figure 5. Sequence Diagram

3.5 Data base Design

The design of the database was the stage for mapping a conceptual model to the model database will be used.

3.5.1 Table Relation

Table relation is the set of relationships between multiple tables in the database system can be seen in Figure 6.

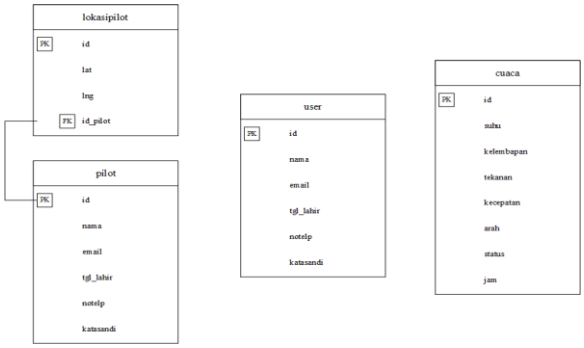

Figure 6. Table Relation

3.6 Hardware Implementation

This section discusses the hardware used to run the Systems Monitoring Pilot Paragliding and IoT-based weather station. Details of used computer hardware can be found in Table 1.

Table 1. Computer Hardware Used

No.	Hardware	Specification
1	Processor	3.1 GHz
2	Memori	8 GB
3	*Hardisk*	1 TB
4	VGA	2 GB
5	Monitor	14 "with resolution 1336 x 768 pixels
6	Mouse	*Optical Mouse*
7	Keyboard	*Standard*
8	Network	*Network connection using WIFI*

For the smartphone hardware used can be seen in Table 2.

Table 2. Smartphone Hardware Used

No.	Hardware	Specification
1	Processor	1.4 GHz
2	Memori RAM	3 GB
3	Internal Memori	32 GB

The device's Internet of Things (IoT) is a device consisting of mikrokontroller, sensors and modules. The specifications of the device can be seen at IoT can be seen on Table 3.

Table 3. IoT Hardware Used

No.	Hardware	Description
1	Mikrokontroller	Arduino UNO, Raspberry Pi 3
2	Air temperature sensor	DHT11
3	Air humidity sensor	DHT11
4	The air pressure sensor	BMP180
5	Wind speed module	Anemometer Module
6	Wind direction module	Windvane Module

3.7 Software Implementation

Before you can run the System Monitoring Pilot Paragliding and IoT-based weather station, computer used already installed the required software can be viewed at Table 4. and Table 5.

Table 4. Computer Software

No	Software	Specification
1	Operating System	Windows 10
2	Browser	Google Chrome
3	Internet	Connect to the internet network

Table 5. Smartphone Software

No	Software	Specification
1	Operating System	Android
2	Paralayang Gunung Panten Applications	20.94 MB

3.8 Interdace Implementation

3.8.1 Website Interdace

Figure 7. display the login interface is the website for the Manager.

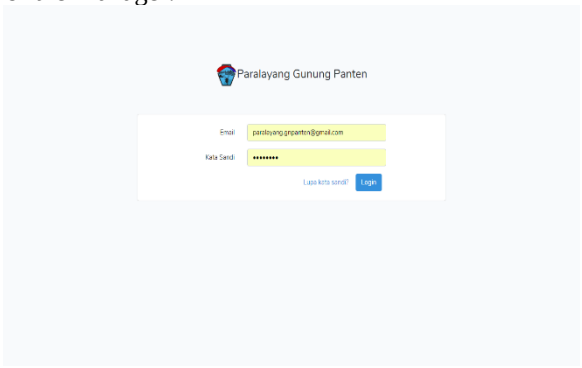

Figure 7. Display Interface Manager Login

Figure 8. adalah tampilan antarmuka beranda website untuk pengelola. is the home website for interface display manager.

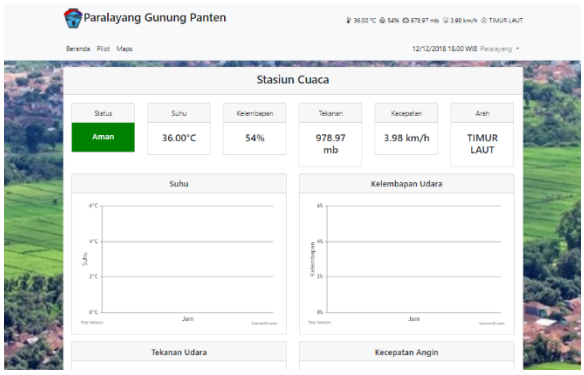

Figure 8. Display Interface Manager Beranda

Figure 9. Pilot Data interface is the website for the Manager.

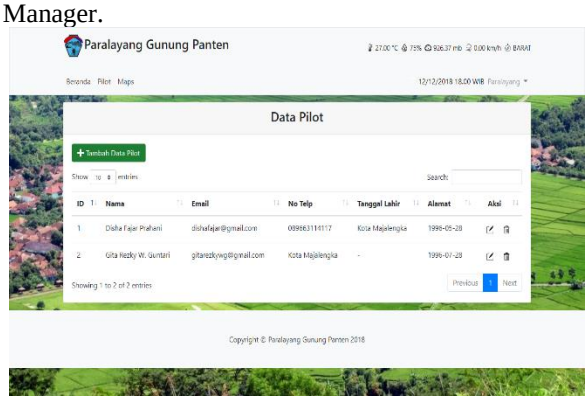

Figure 9. Display Interface Pilot Data

Figure 10. is the display interface Maps website for the Manager.

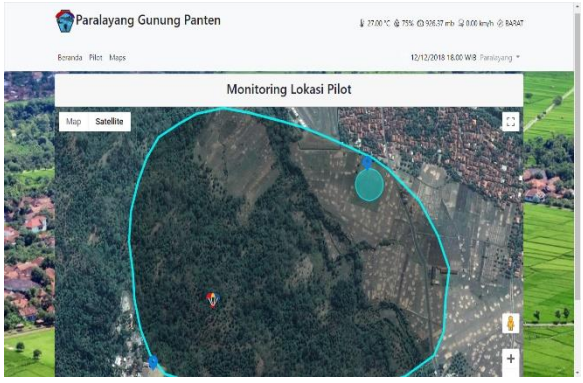

Figure 10. Display Interface Maps

3.8.2 Antarmuka Android

Figure 11. is the display interface home android applications for the pilot.

Figure 11. Display Interface Pilot Login

Figure 12. is the display interface home android applications for the pilot.

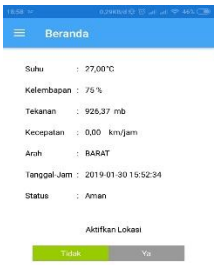

Figure 12. Display Interface Pilot Beranda

3.9 IoT Hardware Testing

Testing conducted with the DHT11 sensor, sensors, BMP180, module, module windvane Anemometer, GPS on Smartphones and the overall work tool. Testing was performed for 1 hour on Wednesday, January 9, 2019 in Paralayang Gunung Panten Majalengka.

3.9.1 DHT11 Sensor Testing

DHT11 sensor is a sensor used to measure the temperature and humidity of the air, the sensor DHT11 is stored in the blue tube. From Figure 13. It can be seen that the sensor can work well, the test results obtained at 10.00-11.00 for the average air temperature 34 ° C and the average air humidity is 56%.

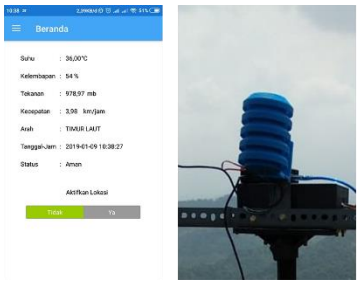

Figure 13. DHT11 Sensor Testing

3.9.2 BMP180 Sensor Testing

BMP180 sensor is a sensor used to measure the air pressure, the BMP180 is stored in the sensor tube is blue. From Figure 14. It can be seen that the sensor can work well, the test results obtained at 10.00-11.00 for the average air pressure 978.55 mb.

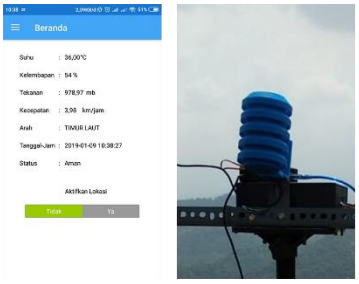

Figure 14. BM180 Sensor Testing

3.9.3 Anemometer Module Testing

The module is the module used Anemometer for measuring wind speed. From Figure 15. It can be seen that the module can work well, the test results obtained at 10.00-11.00 for an average wind speed of 2.09.

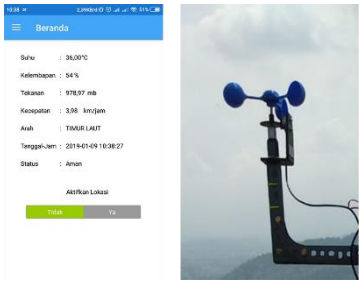

Figure 15. Anemometer Module Testing

3.9.4 Windvane Module Testing

Windvane module is a module which is used to measure wind direction. From Figure 16. It can be seen that the module can work well, the test results obtained at 10.00-11.00 to wind direction often leads to the Northeast.

Figure 16. Windvane Module Testing

3.9.5 GPS on Smartphones Testing

GPS on Smartphones is used to view the location of the pilot paragliding who was doing the flight.

Figure 17. Enable GPS

3.10 Beta Testing

The beta test is done to find out the assessment of the Monitoring System Pilot Paragliding and IoT-based weather station built by the method of interview.

Table 6. Interview Beta Testing

Question	Answers
What does paragliding pilot monitoring system and weather station is able to monitor properly?	Yes, good enough
How do you feel about using this monitoring system?	Quite convenient to use, because the website can be accessed on a variety of platforms.
Do you think the weather station monitoring in accordance with the weather conditions on the mountain paragliding panten?	Yes, according to the weather conditions on the Mountain Paragliding Panten Majalengka
This monitoring system requires a network of the internet to work, wouldn't it be problematic?	It does not matter because there is a wifi network
Weather station instruments could not be exposed to heavy rain, wouldn't it be problematic?	No problem, because there is always a Manager on duty in the area.

4. CONCLUDING

4.1 Conclusions

Based on the results of the testing of software and hardware that has been created as a paragliding pilot monitoring system and weather station-based IoT then retrieved the following conclusions:

1. The system that has been built up can monitor weather and wind forces through the website or android applications.
2. The system that has been built up can reduce the level of kecelakan that occur because of incorrectly predict the weather and wind speed.
3. The system that has been built up can monitor the pilot when it came out of the flight path to the display in the form of maps on the website manager as well as the notification form notice to pilots if out of the flight path.

4.2 Sugestions

The system has been made still need to be developed more to the future so that the system that has been built up can work much more optimally. As for the suggestions to the development of software and hardware are constructed are as follows:

1. The system can monitor the altitude pilot paragliding flying.
2. The system can tell the distance of the flight area into the distance when the pilot is outside the area of flight.
3. Instruments weather station using solar panel power source.

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