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# Flood Monitoring System with Smart Solar Module for Implementation of Flood Problem Area

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***Abstract*—One of the uses of electricity that is widely used by society today is as a source of lighting. Increasing community mobility at night make all activities that require good lighting in the office, at home, even on public roads. Public Street Lighting (PJU) in the smart solar technology system will be integrated with a security system to monitor for monitor the condition water level of the river in flood-prone areas. With flexible energy sources, placing flood detectors is easy connected to the desired position. The sensor will send an SMS automatically to the cell phone number that has been set from the program to notify the news of the position of the water level. From the top surface of the river, it will provide information that a height of 500 cm means that it is dangerous to have crossed the embankment, a level below which a height of 450 cm means standby 3, and a height of 400 means standby 2 and a height of 350 cm means standby 1. For the danger level, additional information will be given in the form of red lights of the tool box. This also provides a sign for local residents to be able to see directly the condition of the water level from the lights that are on.**

***Keywords—sensor, led light, sms, solar panel***

## I. INTRODUCTION

Public street lighting is lighting that is public (for the common good) and is usually installed on roads or in certain places such as parks and other public places. In its development, PJU ignition can be done with a timer or a timer switch. With the development of solar panel technology, the installation of Solar Power Plants (PLTS) in areas that do not yet have an electricity network from PLN has become an alternative to obtain lighting and support various daily community activities [1] (see figure 1).


Fig. 1. Public street lighting with smart system.

PJU operational review is no longer necessary with visits to each light point, just through communication devices such as laptops. The condition of each lamp such as the state of the lamp, battery, and controller can also be reported automatically so that it can be known immediately. Having a history record on the system also helps in planning maintenance and repairs so that damage/blackouts can be avoided. And with the results of the solar cell that has been applied with public street lighting, it will be added with a river water level detection function, this is taken on the basis because there are several areas that are often flooded.

The lighting in question is a complete unit consisting of a light source (lamp/luminaire), optical elements (reflector, refractor, and diffuser). Electrical elements (connectors to the power source / power supply, etc.), a support structure consisting of a support arm, a vertical truss and a lamp post foundation. Muhaimin (2001) describes that the fundamental concept of designing a lighting system is to determine the distance of the lighting pole.

$$Distance = \frac{Discharging\ factor \times loss\ factor \times light\ flux}{Road\ width\ \times strong\ lighting}$$

From the above formula, the usage factor only consists of the length of use of the lighting lamp, which is 12 hours, the loss factor or better known as the light-loss factor (LLF) is influenced by 2 factors:

1. Decrease in the ability of lighting sources (lamps and armatures) due to age of use.
2. Dirt on the armature, due to dirt or changes in the nature of the armature cover.

Street lighting in urban areas has the following functions (SNI 7391:2008):

1. Produces contrast between the object and the road surface.
2. As a navigation aid for road users.
3. Improve the safety and comfort of road users, especially at night.

4. Support environmental safety.
5. Provide the beauty of the road environment.

Photovoltaic (PV) is a technology and research sector that deals with the application of solar panels for energy by converting sunlight into electricity. Due to the growing demand for clean energy sources, the manufacture of solar panels and photovoltaic pools has expanded dramatically in recent years [2].

The solar charge controller applies Pulse width modulation (PWM) technology to regulate the battery charging function and current release from the battery to the load. 12 Volt solar panels generally have an output voltage of 16-21 Volts. So without a solar charge controller, the battery will be damaged by overcharging and voltage instability. Batteries are generally charging at a voltage of 14 – 14.7 Volts [3].

The sensor also features a high-power acoustic output along with real-time automatic calibration for changing conditions (supply voltage drop, acoustic noise or electrical noise), operation with supply voltage from 3V to 5.5V, object detection from 0-cm to 5.5V. 765-cm (select models) or 1068-cm (select models), and sonar range information from 20-cm to 765 cm (select models) or 1068 cm (select models) with a resolution of 1 cm [4].

## II. Research Methods

The application development method used in this research is the method one of the software development life cycle (SDLC) is the prototype model. The prototype model (prototyping model) can be used to connect client's lack of understanding of technical matters and clarifying requirements specifications what the client wants from the software developer. Often the client imagines the desired needs but is not specified in detail from the customer input, process and output.

The prototype method starts from collecting client needs for the application to be made. Then a prototype program is made so that the client can better imagine what they want. This program usually provides a display with a software flow simulation so that it looks like a ready-made application. Then this prototype program is evaluated by the user until the specifications that the user wants are found.

In making the application development of the autoreply system via SMS using the prototype development method, there are several stages to be carried out, as follows;

1. Needs analysis
2. Prototype making
3. Evaluation of prototypes
4. Coding system
5. System testing
6. System evaluation

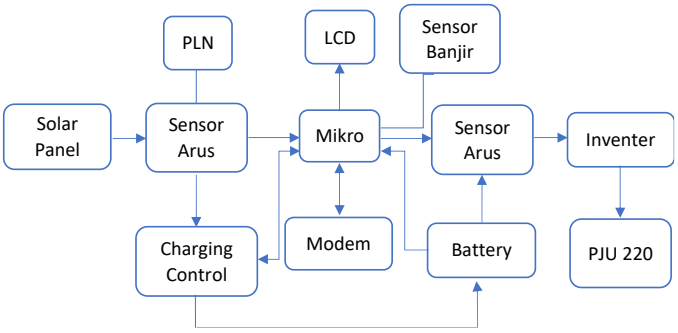



Fig. 2. Smart solar system.

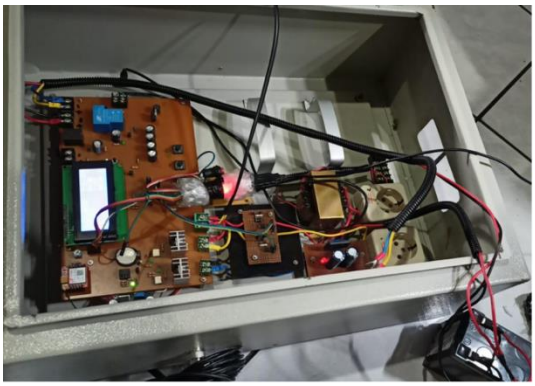
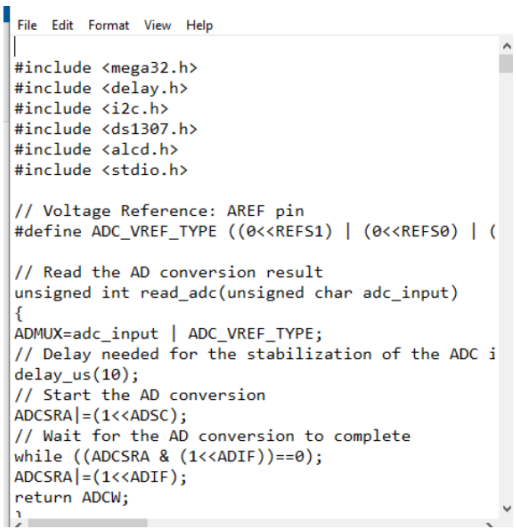


Fig. 3. Circuit box controller.

In the manufacture and assembly of this tool, a self-assembly system is used, starting with the purchase of solar panels, batteries, LED displays, controllers, modems, transformers and sensors (see figure 2 and 3). From the assembly process the controller will be programmed and filled with commands. By using the software mikon.c (see figure 4).



```
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#include <mega32.h>
#include <delay.h>
#include <i2c.h>
#include <ds1307.h>
#include <alcd.h>
#include <stdio.h>

// Voltage Reference: AREF pin
#define ADC_VREF_TYPE ((0<<REFS1) | (0<<REFS0) | (

// Read the AD conversion result
unsigned int read_adc(unsigned char adc_input)
{
ADMUX=adc_input | ADC_VREF_TYPE;
// Delay needed for the stabilization of the ADC i
delay_us(10);
// Start the AD conversion
ADCSRA|=(1<<ADSC);
// Wait for the AD conversion to complete
while ((ADCSRA & (1<<ADIF))==0);
ADCSRA|=(1<<ADIF);
return ADCW;
}
```

Fig. 4. Programming language that is entered in the microcontroller chip.

From the program that is set and the command data is transferred to the microcontroller chip so that the process from the box controller will work as desired.

## III. DISCUSSION

In this discussion will show the results that will be given from the tool.

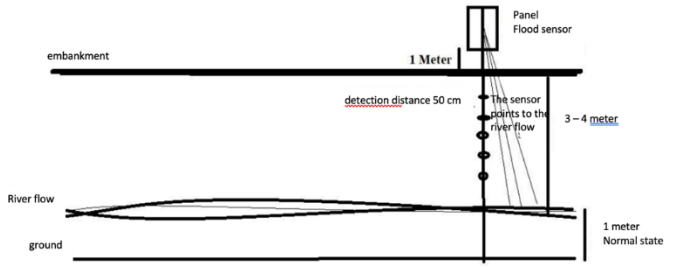


Fig. 5. Simulation concept.

From the concept of the tool running (figure 5), the sensor system in the Controller / Detection Panel Box (sensor) will detect or read the barrier or here the river water is enabled, where the water level will affect the condition of the sensor reading, in that level setting every 50 cm will provide information condition of river water, in the microcontroller synchronization with sensors that will work to provide information in the form of SMS to the admin or the designated card number indicating that the water level for the current position is what is the value?

Fig. 6. Tool testing.

From the picture shows the LED Display (figure 6) on the top right of the information for the water level, there the sensor test with a barrier distance of 277.00 means that the height is 277 cm and the other one also shows a value of 300.00 which means the water level is 300 cm.

As for the test results, information will be implemented easily and quickly by installing a modem system in the microcontroller so that it will provide direct SMS information to the designated admin or set in the program so that information does not need to directly monitor current conditions or circumstances.

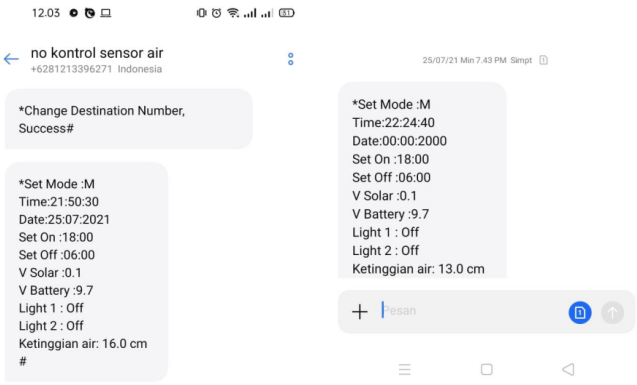


Fig. 7. SMS information display.

From the figure 7, it shows that the information is not only the water level but also other information in the program, such as; time or SMS time, SMS date or date, Set On and set off and so on, and the main thing is that the water level in the picture shows the water level of 13cm and 16 cm, and other information is technical data that provides conditions in the controller box with a variety of connected and wired devices.

## IV. CONCLUSIONS

From the research results obtained the following conclusions;

1. The results of the control system for water level information that were tested were successful, where testing at near and far conditions provided appropriate information from the sample showing a change in distance from 277 cm to 300 cm.
2. The SMS results obtained also provide a lot of data that can be read, including the changing water level, from the 13 cm and 16 cm test, as well as other time and voltage setting data from the battery and solar panels.

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