

Artikel 3

by Elang Timoho

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Development of a Simple Data Logger using Seeeduino Stalker and The Data Visualization using Processing software

Dian Artanto

Mekatronika

Politeknik Mekatronika Sanata Dharma
Yogyakarta, Indonesia
dian.artanto@gmail.com

Yosef Capertino W.P.

Mekatronika

Politeknik Mekatronika Sanata Dharma
Yogyakarta, Indonesia
jcapertin@yahoo.com

Khriswara Dwitanyto

Mekatronika

Politeknik Mekatronika Sanata Dharma
Yogyakarta, Indonesia
christrops@gmail.com

Abstract — This paper presents the development of a simple data logger using Seeeduino Stalker and the data visualization using Processing software. The background of this development is the problems encountered in making a data logger, which must meet the following criteria: able to read data one or more sensors, able to store the data, able to be operated for a long time, even if placed in an area that has no electricity supply. In addition, the data that stored in the data logger should be loaded and displayed on a computer without having to stop the operation of the data logger. In this study, the data logger that meets these criteria has been developed using Seeeduino Stalker hardware and using Processing software for the data visualization.

Keywords — A Simple Data Logger; Seeeduino Stalker; Data Visualization; Processing software

I. INTRODUCTION

In general, the main function of a data logger is to read and store sensor data. To store this data, a data logger is usually equipped with a memory card. Although the data inside the memory card can be read easily with a memory card reader, but to use the reader, memory card must be removed from the holder, which will make the data logger stop operating. In critical applications, the data logger must not stop operating.

Due to that problem, the development of a simple data logger is started. It is expected that this development could result in a simple data logger that able to be operated in a long time with battery power, able to read sensor data, able to store the data, and the data can be loaded and displayed on a computer.

In this study, the data logger will be applied to a weather meter, which is equipped with a wind speed, wind direction and a rainfall meter. In addition, the device is also equipped with a temperature and humidity sensor SHT11, a barometric pressure sensor BMP085, a level sensor for measuring water evaporation, and a photo resistor to measure light intensity and a soil moisture sensor. The weather meter will be placed in the area that far from electricity. Therefore, in order that the data logger can be operated for a long time, in addition to adding a solar cell to charge the data logger battery, the data logger must be able to save on power consumption.



Fig. 1 Data logger is used for weather meter application

II. METHODS

A. Data logger using Seeeduino Stalker

As mentioned earlier, Seeeduino Stalker used for this development of a simple data logger. From the official website Seeeduino Stalker, stated that Seeeduino Stalker is an Arduino compatible Wireless Sensor Network node with data logger functionality. Seeeduino Stalker is equipped with a Temperature sensor, RTC with backup power, SD Card Socket, Bee Socket and Solar LiPolimer Ion Battery Charger.

B. Data Visualization using Processing software

Processing software selected here to make data visualization from the data logger. From processing.org stated that Processing is an open source programming language and environment for people who want to program images, animation, and interactions. It is used by students, artists, designers, researchers, and hobbyists for learning, prototyping, and production. It is created to teach fundamentals of computer programming within a visual context and to serve as a software sketchbook and professional production tool. In short, this Processing software has advantages and ease of use in making data visualization.



Fig. 2 Seeeduino Stalker

C. Weather meter with Seeeduino Stalker

Here Seeeduino Stalker is used for the data logger on a weather meter. To save the power consumption, Seeeduino Stalker is programmed to enter sleep mode every 15 minutes, after reading sensor data.

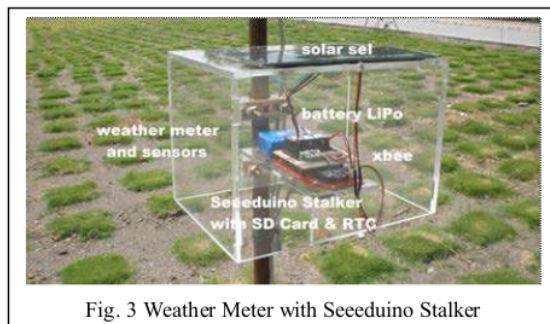


Fig. 3 Weather Meter with Seeeduino Stalker

The work process of Seeeduino Stalker as a data logger on the weather meter can be shown in the following Flowchart.

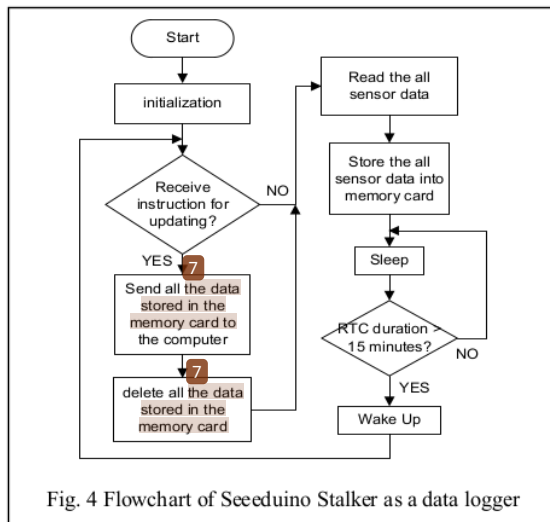


Fig. 4 Flowchart of Seeeduino Stalker as a data logger

As shown in the flowchart above (Fig 4), Seeeduino Stalker is programmed to work to read sensor data, save the data to the memory card, then go into Sleep mode. This method is done to save data logger power consumption. Then after some time, the Seeeduino Stalker is woken up automatically with the help of the RTC (Real Time Clock). In this case here, RTC Seeeduino Stalker is set to wake Seeeduino Stalker every 15 minutes.

Also shown in the flowchart above (Fig 4), anytime when Seeeduino Stalker receives a request from Processing to update the data, then Seeeduino Stalker will send all data on the memory card. After the data has been sent, Seeeduino Stalker then deletes the contents of the memory card. This method is done to make the contents of the memory card is not too full, and also to avoid sending data that is too long because of the amount of data that must be transmitted.

Here is a flowchart of the work process to make the data visualization using Processing software:

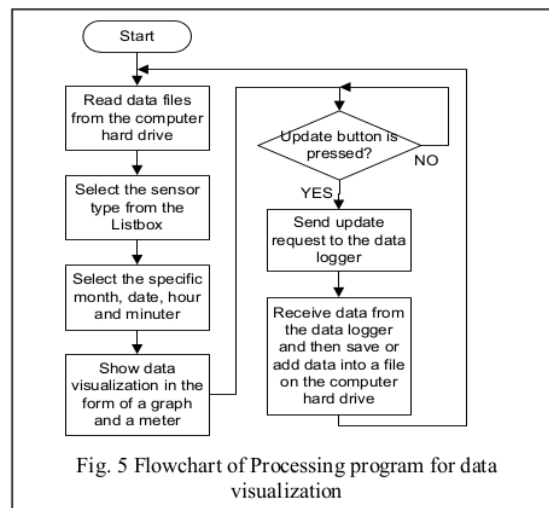


Fig. 5 Flowchart of Processing program for data visualization

As shown in the flowchart above (Fig. 5), initially the program will take an existing file on the computer to visualize data in the form of a graph and a meter, which is based on the type of sensor selection and time.

Also shown in the flowchart above (Fig. 5), the Processing software programs deliberately designed to not display the new data, except when the update button is pressed. When the update button is pressed, Processing will send a certain character to the data logger as a sign of the update data request. When the data logger accepts this character, then the data logger will send all data on the memory card. Then this data will be received by Processing, and stored with the file name as the name of the month at the time of the reading. With this method, the computer does not need to be turned on constantly to take new data. Anytime the new data can be retrieved from the data logger, loaded and displayed to the computer by pressing the update button.

III. RESULTS

By applying the above method and work process as shown in the flowchart above on Seedeuino Stalker and Processing software, obtained the following results. The following image shows screenshot of data transmitted by the data logger when a data requests received by the data logger.

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12,5,2014,2,15,6,29,10,29,39,28,75,0,00,270,00,74,01,99232,23,99,0,00,1022,0,7,27
12,5,2014,2,30,6,29,09,29,38,28,80,0,00,270,00,74,07,99223,23,99,0,00,1023,0,3,27
12,5,2014,2,45,6,29,06,29,36,28,80,0,00,270,00,74,24,99244,24,00,0,00,1023,0,3,28
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12,5,2014,3,30,6,28,98,29,27,28,80,0,00,270,00,74,67,99227,24,02,0,00,1023,0,3,27
12,5,2014,3,45,6,28,94,29,25,28,80,0,00,270,00,74,78,99233,24,01,0,00,1023,0,2,27
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12,5,2014,6,0,6,28,82,29,11,28,25,0,00,270,00,75,06,99270,23,96,0,00,1023,0,5,27
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12,5,2014,7,45,6,28,47,28,72,27,75,0,00,270,00,67,37,99396,21,83,0,00,1023,0,16,27
```

Fig. 6 Screenshot of the data obtained from the data logger during the period of 02:15:06 - 07:45:06 on May 12, 2014

The following pictures show the display of data visualization program using Processing software. It appears there are 3 columns in the display program. The first column contains 5 listboxes, which provides the option to select the channel of communication, the types of sensors and reading time that are sorted starting from the month, date, hour and minute.

The second column displays a graph of the data based on the selection of the types of sensors and reading time in the first column. The graph displays data visualization for 1 full day (24 hours).

The third column displays a meter of the data based on the choice of the types of sensors and reading time in the first column. The meter displays the visualization of data at a specific time, in hours and minutes specified.

At the bottom of the meter is also displayed the maximum value, the minimum value and the average value of all sensor data read in one day according to selected reading time.

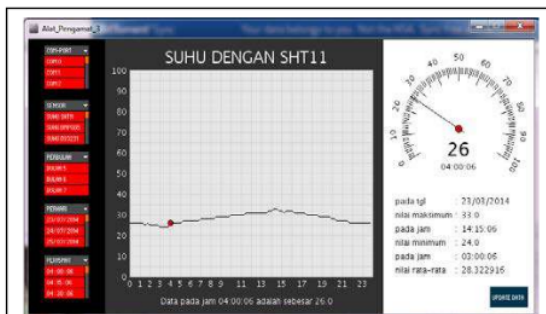


Fig. 7 Display data visualization of the SHT 11 sensor on March 23, 2014, at 04:00:06

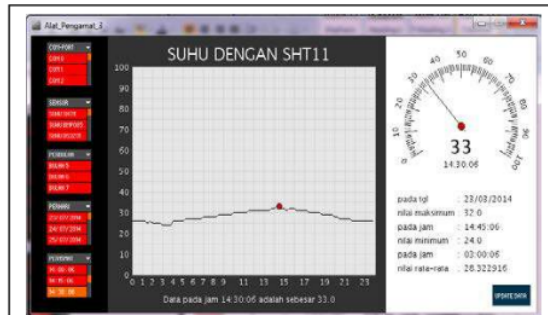


Fig. 8 Display data visualization of the SHT 11 sensor on March 23, 2014, at 14:30:06

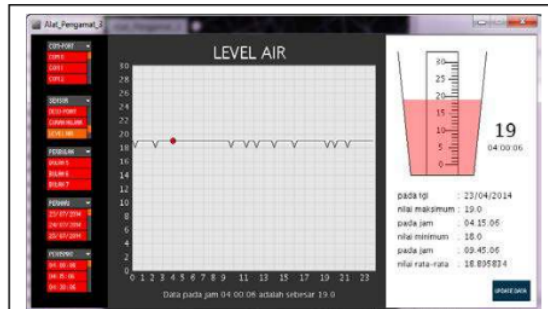


Fig. 9 Display data visualization of the SHT 11 sensor on April 23, 2014, at 04:00:06

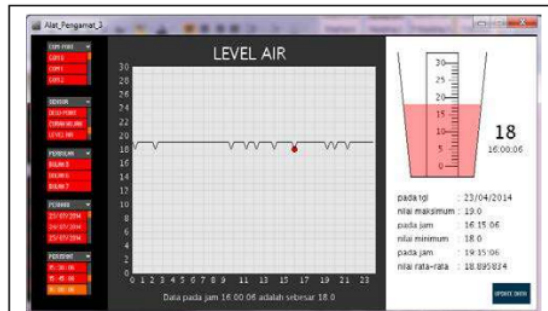


Fig. 10 Display data visualization of the SHT 11 sensor on April 23, 2014, at 16:00:06

IV. CONCLUSION

From the results of the development of a simple data logger using Seedeuino Stalker and data visualization using Processing software, the following things can be concluded:

1. A simple data logger, battery-powered and saving power consumption has been successfully developed using Seedeuino Stalker.

2. By using Processing software, upload and displaying the data from the data logger memory card to a computer, without the need to stop the operation of the data logger, has been successfully developed. Also the data visualization program using Processing software that presents the data based on time, either in the form of a graph and a meter, has been successfully developed.

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