Implementation of Hand Tractor Control Device Remotely Using Flysky Fs-I6 Remote Control

Riyan wahyudi
Department of electrical engineering
Science and Technology Study Program,
Binadarma University, Palembang
riyanwahyudi301100@gmail.com

Muhamad ariandi
Department of electrical engineering
Science and Technology Study Program,
Binadarma University, Palembang

***Abstract* – Hand tractors are agricultural tools used to minimize the use of human labor, so as to increase the effectiveness and efficiency of the process of plowing rice fields. The use of hand tractors for cultivating agricultural land still causes several problems such as work fatigue and ergonomic problems for operators which can result in accidents while working. From this problem the author had the idea to build a tool that could be installed on a hand tractor so that the hand tractor could be controlled remotely using a remote control. In the hardware section, the main control uses an atmega328 microcontroller on the Arduino nano board, a Flysky FS-i6 remote control as input for sending remote commands, a servo motor as an output for the gas mechanical drive on the tractor, a power window that pulls the tractor clutch to turn right and left, the panel solar for battery charging. Based on the results of tool testing, tool performance testing was carried out at a distance of 1 to 100 meters. At this distance, the tool worked well and no errors occurred. The area of one rice field ranges from 10 x 10 meters to 50 x 50 meters, so that remote hand tractor control equipment can be used and there will be no errors even over long distances. This shows that this tool has been successful and the tractor can be controlled remotely.**

***Keywords: Hand Tractor, Flysky Fs-I6 Transmitter, Servo Motor, Power Window, Solar Panel, Pzem Sensor*.**

I. INTRODUCTION

The rapid development of agricultural technology as an effort to improve the quality and quantity of production to meet the needs of food and the rapid development of the human population [1]. The hand tractor machine is an agricultural tool used to minimize the use of human labor, so as to increase the effectiveness and efficiency of the process of plowing rice fields. The latest technology today and which is often used for the application of agricultural land in Indonesia, especially in plowing fields, is the hand tractor machine [2]. This tool functions the same as a traditional rice plow, but the tractor uses iron wheels that rotate with engine power that functions as a drive and is installed on top of the tractor construction to divide, turn and loosen the soil, while if using the traditional method requires a longer time and costs a lot because the traditional way to plow the fields is using cows or buffaloes. Cultivating the land with a hand tractor can speed up the work of plowing a larger area of land and the process of splitting, turning and loosening the soil can be done simultaneously [3]. The use of hand tractors directly has problems and obstacles including engine noise and vibration that are felt directly by the operator. Noise from tractor engine sounds, of course, can To use agricultural equipment, of course, you must know how to prevent the occurrence of safety and work comfort problems caused by discomfort caused by these agricultural tools and machinery, then workers will feel exhausted and then there will be accidents while working [4]. Then another problem caused by hand tractor agricultural machinery is a heavy load for a long period of time and to move or operate it requires considerable power from the tractor engine user [5]. From the magnitude of the risk of danger that may occur raises innovations and technologies that are expected to help agricultural workers in working without having to use manual labor and can be controlled remotely without having to operate the tool or machine.

II. BASIC THEORY

Remote portable remote remote hand tractor controller is a solution to all problems that can reduce the risk of work accidents during the process of plowing fields using hand tractors. The manufacture of this tool is focused on controlling the gas lever and right-left clutch during the operation of the hand tractor engine. The use of a remote control system placed in the thorttle and clutch can make it easier for the operator of the hand tractor machine to control the speed and turn of the hand tractor engine that is controlled using a remote wireless remote that has been connected to the tractor.

A. Hand tractor

A hand tractor is an agricultural machine used for cutting and shoveling soil. This machine has high efficiency because it can perform soil turning and cutting simultaneously. Tractors are also used for planting, caring for crops, running irrigation pumps, harvesting (by installing a reaper), turning rice threshing machines, transporting all kinds of seeds,

fertilizers, agricultural equipment, to agricultural products. A hand tractor is an agricultural tractor that is only one-wheeled (two-wheeled). The tractor is available in lengths from 1, 740 to 2, 290 mm, width from 710 to 880 mm and power from 6 to 10 hp[6].

Figure 1. hand tractor

B. Arduino uno

The Arduino Uno Board is a datasheet-based microcontroller that has 14ppin input from a digital output where 6 input pins can be used for PWM and 6 analog input pins, 16 MHzcrystal oscillator, USB type A port connection, power control jack, ICSPkheader, and there is a reset button. So that the microcontroller can be used just connect the Arduino board to a computer or PC using USB type A, if it has been programmed to run it just connect it to a 5 volt DC current source. Each 14-pin can give or receive a maximum current of 40 mA and has a resistor that can be disconnected by default[7].

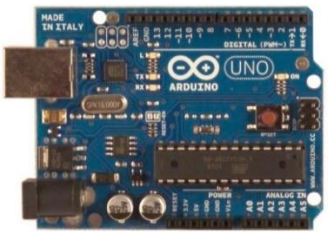

Figure 2. Arduino uno

C. Flysky FS-i6

Fly sky FS-i6 is a 2.4ghz telemetry 6-channel computer transmitter that uses automatic frequency digital spectrum deployment system technology. Using this type of transmitter allows a safe remote control mechanism with a considerable distance and can be adjusted according to user needs. With a long enough control distance, it can certainly help farmers control the machine. The tranmitter uses 4 A2 batteries so that it produces a voltage of 6 volts dc because the transmitter requires a voltage of 6 volts dc[8].

Figure 3. Flysky fs-i6

D. Sollar cell

Solar energy is used as an alternative source of electrical energy, by using solar cell energy or light emitted by the sun converted into electrical energy that is more environmentally friendly and does not cause air pollution. Indonesia itself has an average solar radiation intensity of around 4.8 kWh / m2 per day throughout Indonesia [9]. Sollar controller charger uses PWM (Pulse Witdth Modullation) which Often in the manufacture of electronic circuits or microcontroller modules there is a difference in working voltage between modules so that a regulator module is needed to adjust the voltage to fit[10]

Figure 4. sollar cell

E. Pzem sensor

The PZEM-004T sensor is a sensor that functions as an electrical measuring device because one of its advantages can display voltage, current, power, energy and also electrical frequency values. This sensor also uses serial data communication between the sensor and microcontroller, which operates through 2 pins, namely RX (Receive) pin to receive data and TX (Transmit) pin to send data[11].

Figure 5. Pzem Sensor

III. METHOD AND DESIGN

The stage of the research method can be seen in the followingfigure

1. In the first step, the author will read and analyze the literature relevant to the problem to be discussed. Literature research is carried out by searching for information from various sources, including scientific journals, books, and reliable sources on the internet. At this stage, problems were found in the design of the emergency button and unsatisfactory test results of the device. Therefore, through this literature research, it is hoped that innovations and improvements can emerge that will be the basis for further research.
2. Next, namely the hadware design stage, the author will design in accordance with the requirements of the tools needed. In this system, the flysky s-i6 remote control will be used as a remote motion command signal sending device. In addition, additional receiver hardware will be installed to receive movement signals which will then be processed by Arduino. Details of hardware design can be found in the following diagram. After the series is complete, the next step is Measurement is

carried out with the aim of assessing the value obtained from each measurement point of the tool that has been made, and by knowing the results, we can evaluate the performance of the tool that has been made. This measurement process will facilitate the author in conducting further analysis and discussion.

3.

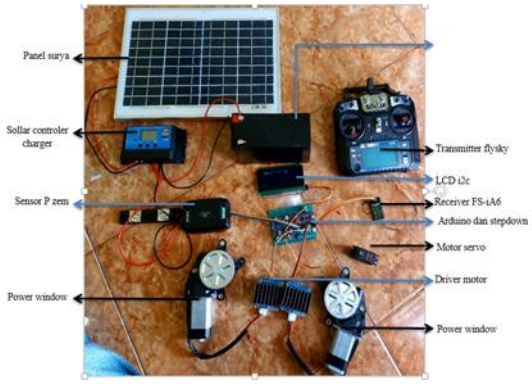

Figure 6. component

4. The next step is Testing the performance of the tool is carried out by giving action to the tool then testing the tool with a load (after being attached to the hand tractor) which includes system response, energy consumption.
5. The last stage, namely Conclusion in this phase is that the author describes and unites the aspects that have been discussed in the research, then draws conclusions briefly.

IV. RESULT AND DISCUSSION

Designing hardware involves planning the manufacture of a tool. In such planning, it is important to pay attention to the placement of components necessary for the construction of tools. By considering the unique characteristics of each component, it can reduce the possibility of errors in the design process.

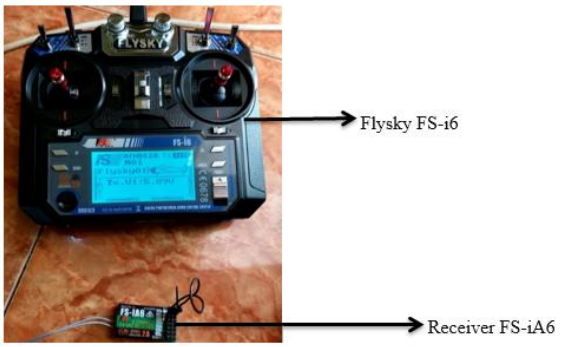

Figure 7. binding process

In the picture above is a binding process is an important stage that aims to convect between the fs-i6 transmitter and the fs-ia6 receiver can be connected via radio waves.

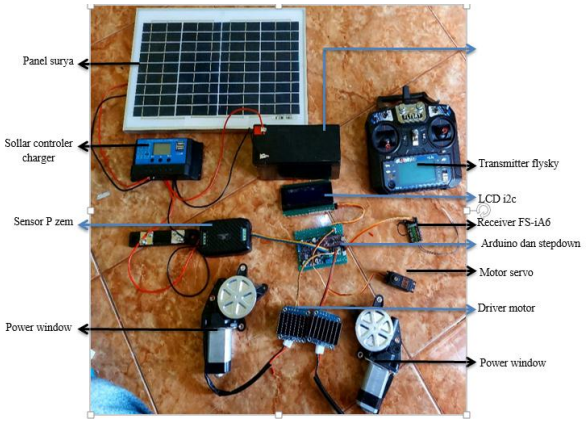

Figure 8. assembly

In the picture above is the stage of connecting all components needed for the manufacture of remote hand tractor control devices.

1. System respons

System response refers to changes in output behavior in response to variations in input signals. The purpose of the system response is to estimate the time needed by the actuator to be able to move at each angle [12]. The steady state response is used to measure the duration for which the system is steady to indefinite[13].

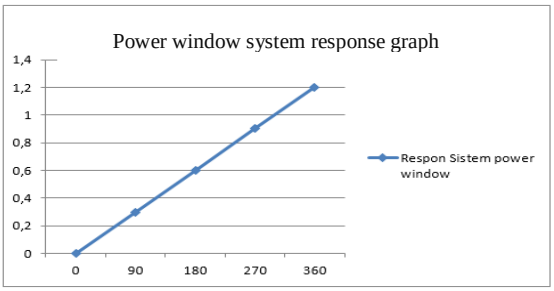

Figure 9. Power window system response graph

The response of the power window system above gets the results by the power window at predetermined angles of 90 °, 180 °, 270 °, 360 ° respectively which is 0.3, 0.6, 0.9 and 1.2 seconds. The average result of measuring system response using a stopwatch is 0.7 seconds.

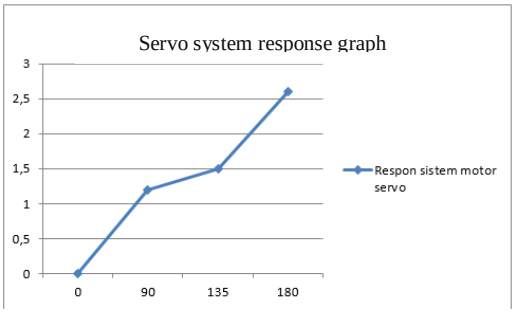

Figure 10. Servo system response graph

The response of the servo motor system above has been obtained by the servo motor at predetermined angles of 90 °, 135 and 180 ° respectively has obtained results of 1.2, 1.5 and 2.6. The average result of

measuring system response using a stopwatch was 1.76 seconds.

2. Voltage

Voltage measurement is usually done using a digital multimeter. The purpose of voltage measurement is to determine the minimum value of the applied voltage source.

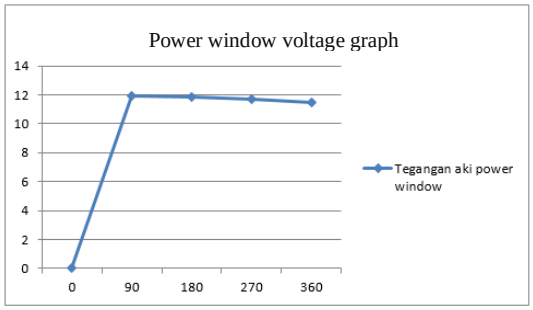

Figure 11. Power window voltage graph

Voltage measurements were carried out at each predetermined angle, namely 90°, 180°, 270° and 360°, namely 11.94, 11.88, 11.66 and 11.50 respectively. The average result of measuring voltage using a digital multimeter is 11.74 volts DC.

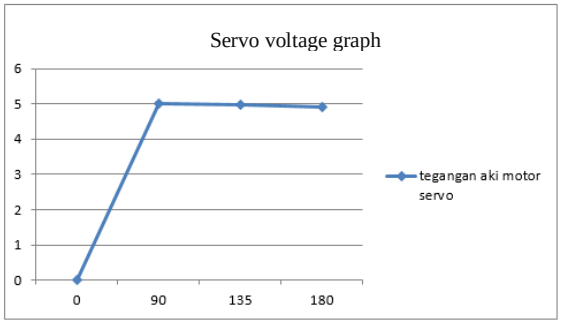

Figure 12. Servo voltage graph

Measurements made at predetermined angles of 90°, 135°, and 180° have obtained results of 5.06, 4.96, and 4.90 respectively. The average result of measuring voltage using a digital multimeter is 4.97 volts DC.

3. Strong current

Electric current is the amount of electric charge that flows through a conductor in a given time interval. Measuring electric current aims to determine the value of I (current), thus allowing the calculation of changes in energy consumption. An electric current of 7.5 amperes represents the continuous flow of electrons in the conductor. This occurs due to the presence of an inequality in the number of electrons at various locations, resulting in a constant movement of electrons [14].

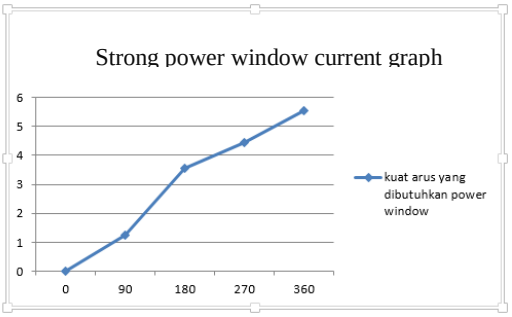

Figure 13. Strong power window current graph

The current quartz measurement required by the power window above is calculated at predetermined angles of 90°, 180°, 270°, and 360° with data results obtained respectively namely 1.23, 3.55, 4.44, and 5.53 Amperes. the average result of measuring current using a digital multimeter is 3.68 Amperes.

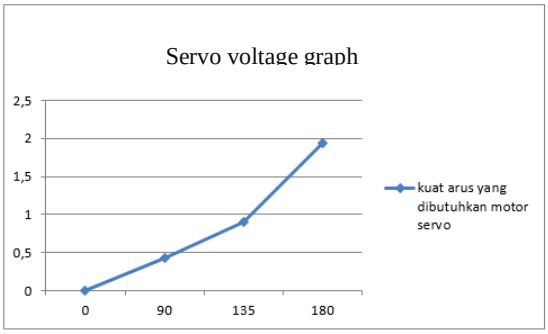

Figure 14. Servo voltage graph

The current strength required by the servo motor above with predetermined angles of 90 °, 135 °, 180 ° obtained the results of consecutive measurement values of 0.43, 0.9, 1.93 Amperes. the average result of current measurement using a digital multimeter is 1.08 Amperes.

4. Power

Power is a measure of the work done in a certain time interval. Power in watts is obtained from a load at any time equal to the voltage at that load multiplied by the current flowing through it. Power is calculated from the output produced by the servo motor at a certain angle of motion level. Power is calculated based on the result of multiplication between the sum of voltages and currents produced [15].

1. Power window measurement
   P = V (voltage) x I (current)
   P average = 11,74 volt DC x 3,68 Ampere = 43,2 Watt
   So the power needed to drive the power window is 43.2 watts
2. Motor servo measurement
   P = V (voltage) x I (current)
   P average= 4,97 volt DC x 1,08 Ampere = 5,36 Watt
   So the power needed to drive the power window is 5,36 Watt

V. CONCLUSION

From the test results the device can work well, the measurement of the tool before and after being given a power window load and servo motor has not obtained a result that is not much different. The distance of the flysky fs-i6 remote control although it has not reached the maximum distance but is enough to control a long-distance tractor for one plot of rice fields.

REFERENCES

[1] I. Kholili, "The Analisis Manajemen Keuangan Petani dan Perkembangan Ekonomi Keluarga," *J. Ilm. Bisnis dan Ekon. Asia*, vol. 13, no. 1, pp. 7–14, 2019, doi: 10.32812/jibeka.v13i1.95.

[2] Fattahaya, "Modernisasi Pertanian Pada Petani Padi Di Kecamatan Bandar Baru Kabupaten Pidie Jaya," *J. Ilm. Mhs. FISIP Unsyiah*, vol. 2, pp. 865–906, 2017.

[3] A. Wicaksana and T. Rachman, *济無No Title No Title No Title*, vol. 3, no. 1. 2018. [Online]. Available: https://medium.com/@arifwicaksanaa/pengertian-use-case-a7e576e1b6bf

[4] A. Finawan, Muhaimin, Eliyani, and Hanafi, "Rancang Bangun Prototipe Pengendali Traktor Tangan Secara Jarak Jauh berbasis Mikrokontroler," *Semin. Nas. Politek. Negeri Lhokseumawe*, vol. 3, no. 1, pp. A42–A45, 2019.

[5] Dzulhidayat, *No Titleת את מה שבאמת לנגד וארל השק יכה העינים*, no. 8.5.2017. 2022.

[6] M. Kuddus, *No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関する共分散構造分析Title*. 2019.

[7] R. F. Rizky *et al.*, "Sistem Smart Door Lock Menggunakan Voice Recognition Berbasis Arduino," vol. 4, no. 2, pp. 239–244, 2023.

[8] N. Nithyavathy, S. Arun Kumar, D. Rahul, B. Satheesh Kumar, E. R. Shanthini, and C. Naveen, "Detection of fire prone environment using Thermal Sensing Drone," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 1055, no. 1, p. 012006, 2021, doi: 10.1088/1757-899x/1055/1/012006.

[9] S. P. Listrik *et al.*, "Analisis Potensi Pembangkit Listrik Tenaga Surya Di Indonesia," pp. 43–52.

[10] D. Dzulfikar and W. Broto, "Optimalisasi Pemanfaatan Energi Listrik Tenaga Surya Skala Rumah Tangga," vol. V, pp. SNF2016-ERE-73-SNF2016-ERE-76, 2016, doi: 10.21009/0305020614.

[11] D. A. Ratnasari, B. Suprianto, and F. Baskoro, "Monitoring Daya Listrik Pada Panel Surya Berbasis Internet of Things (IoT) Menggunakan Aplikasi Telegram," *Indones. J. Eng. Technol.*, vol. 5, no. 1, pp. 1–10, 2022, [Online]. Available: https://journal.unesa.ac.id/index.php/inajet/article/view/19101%0Ahttps://journal.unesa.ac.id/index.php/inajet/article/download/19101/8404

[12] B. Wulandari, "Respon Sistem Respon Sistem," pp. 1–29, 2017, [Online]. Available: https://besmart.uny.ac.id/v2/pluginfile.php/97858/mod_resource/content/1/Respon sistem orde 1.pdf

[13] B. Robert and E. B. Brown, "No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関する共分散構造分析Title," no. 1, pp. 1–14, 2004.

[14] I. Dinata and W. Sunanda, "Implementasi Wireless Sensor Network Untukmonitoring Parameterenergi Listrik Sebagaipeningkatan Layananbagi Penyedia Energilistrik," *Nas. Tek. Elektro*, no. 1, pp. 83–88, 2015.

[15] R. Sulistyowat and D. D. Febriantoro, "Perancangan Prototype Sistem Kontrol Dan Monitoring Pembatas Daya Listrik Berbasis Mikrokontroler," *J. Iptek*, vol. 16, pp. 10–21, 2015, [Online]. Available: http://jurnal.itats.ac.id/wp-content/uploads/2013/06/4.-RINY-FINAL-hal-24-32.pdf