Jurnal TAM (Technology Acceptance Model)
Jurnal TAM, Volume 13, Nomor 1, Juli 2022
E ISSN: 2579-4221; P ISSN: 2339-1103, pp.26-33
Accredited SINTA 4 Nomor 23/E/KPT/2019
https://ojs.stmikpringsewu.ac.id/index.php/JurnalTam/index

PROTOTYPE DESIGN OF HONEY EXTRACTOR MACHINE USING ARDUINO MICROCONTROLLER WITH INTERNET OF THINGS (IOT) MODEL

Rulin Swastika[1], Efi Rohman[2], M. Agus Badruzaman Al Khoir[3], Alfian Nuziar[4]
[1]Program Studi Teknik Informatika, Universitas Al-Khairiyah, Cilegon, Banten
[2]Program Studi Sistem Informasi, Politeknik Krakatau, Cilegon, Banten
[3]Program Studi Sistem Informasi, STMIK Pringsewu, Lampung
[4]Program Studi Teknik Elektronika, ATP, Pringsewu
[1]Jl. H. Enggus Arja No 1 Citangkil, Cilegon, Banten, Indonesia
[2]Komplek Bonakarta Blok B07 Lantai 3, Jl. SA. Tirtayasa No.49, Masigit, Cilegon, Banten, Indonesia
[3]Jl. Wisma Rini, No.09 Pringsewu, Lampung, Indonesia
[4]Jl.Pelita II Pringombo Kel. Pringsewu Timur, Pringsewu, Kab. Pringsewu
Email : swastikarulin@gmail.com[1*], efirohman@gmail.com[2], khoir65@gmail.com[3], alfian23@gmail.com[4]

Article history:
Received: May 31, 2022
Revised: June 28, 2022
Accepted: July 4, 2022

Corresponding authors
*swastikarulin@gmail.com

Keywords:
Honey Extractor;
Adruiono Uno R3;
Sensors;
IoT;
Android.

Abstract
The application of appropriate technology based on the Adruino Uno R3 Microcontroller using the Android Operating System has been tested in this research. Sensor technology coupled with Arduino is applied to control the electric motor mounted on the honey bee extractor. It is proven that this can increase harvest efficiency because honey bees can produce directly without building a honeybee nest, which takes 14 days. In addition to time efficiency, the extractor processing process is also more efficient and optimal because all the honey in the hive is removed maximally without damaging the honeybee nest structure. A honey extractor is a tool used to squeeze honeycomb which has been produced by bees and has a high economic value

I. INTRODUCTION

In today's era of the Industrial Revolution 4.0, technology is growing and almost replacing human functions where technology is prioritized and trusted to help complete their tasks, as well as an easy means of information. Technology has also been considered as a human need, especially with its increasingly rapid development. This development does not only occur in developed countries but also in developing countries. With the existence of cell phones, computers, laptops, gadgets to the internet, nowadays, even adults, teenagers and children can use technology. Technology is now affecting society at large in various ways in various regions. Technology can help the development of the global economy, for example, users can use technology as a reference in determining decisions to find materials which suit their needs, by comparing products with one another. In addition, the user becomes easier and of course it does not take much time, so that technology has now become the main tool which must be owned by the community as a means of support in completing human tasks. The Industrial Revolution 4.0 is a phenomenon which collaborates cyber technology and automation technology. The concept of its application is centered on the concept of automation carried out by technology without the need for human labor in the application process. This certainly adds value to efficiency in a work environment where time management is seen as vital and much needed by industry players. In addition, good time management will exponentially impact the quality of labor and production costs.

Apart from the role of technology in the industrial sector, its benefits can also be obtained by all levels of society today. The benefit of

having intelligence is to develop methods and systems to solve a problem in which the problem can also be solved by humans. For example, in the industrial sector, robots are often found to replace humans, especially in repetitive work, such as automatic machines in factories which help in the production process of a product. Intelligent system is an important medium which plays a role in helping human work. One of them is in the use of a honey extractor machine which will be used. The fast and efficient performance of the tool will greatly help farmers or entrepreneurs engaged in honey bee farming in the honey bee harvesting process. Animal husbandry is an activity which maintains and breeds, to be cultivated. Indonesia has a tropical climate and many sources of food for honey bees, so it is very suitable to be used as a place for raising honey bees.

Previous research conducted by Sri Novi Fitri Yani and Hernowo [1], obtained results based on preliminary observations made in Tapung District, Kampar Regency Riau that workers complained of feeling tired they experienced. The workers complained of pain in their necks, backs, legs and hands. This is because they do the work manually and the workplace is also a work tool which is not ergonomic. From the problems which exist in Tapung District, the author intends to redesign the honey extractor to make it easier for honey farmers in Tapung District, Kampar Regency Riau. The method of extracting honey in Tapung District uses the honeycomb cutting method, which means that it has not used tools or is still manual. The redesign of this tool is expected to be able to squeeze honey out of the hive without any remaining honey left. In this redesign, the squeeze process is designed with the concept of anthropometric ergonomics, which means that the squeeze process is no longer standing. The redesigned tool uses an electric motor so that it can speed up the extortion process.

In the second study conducted by Akhmad Syakhroni, Nuzulia Khoiriyah [2]. In this study, researchers designed and made a honeycomb squeezer using electrical energy by considering ergonomic factors for honey farmer groups in Batang Regency. The honeycomb squeezer which was made still has weaknesses. Honey farmers want tools which are made more ergonomic and make it easier for farmers to work but are also able to produce honey in large quantities.

With the development of science and technology, there are many findings of various tools to facilitate human work. For this reason, humans very often use machines, equipment, facilities, and various products in carrying out their daily work and activities. Intelligent Systems / Artificial Intelligence has become a very important public discourse and is often encountered. Artificial intelligence or intelligent systems is the most important branch in the computer world. Computers are not only tools for calculating, but are expected to be empowered to do everything which is usually done by humans. Humans have good knowledge, experience and reasoning abilities. Technology is created to facilitate human work and activities. In order for computers to act like and as well as humans, computers must also be equipped with knowledge and have the ability to reason. One technology which is being intensively developed is artificial intelligence.

II. LITERATURE REVIEW

Intelligent System Concept

The term artificial intelligence comes from the English language. Artificial Intelligence means intelligence which is made. Intelligence here means sharpness in thinking, just like the human brain in solving a problem. Artificial intelligence according to John McCarthy is modeling a human thought process and designing machines so that they can imitate human behavior [3]. According to McLeod and Schell 2001, Artificial Intelligence (AI) was an activity of providing machines such as computers which had the ability to display a behavior which looks and is considered as intelligent as humans[1]–[3].

According to Kristianto 2004, artificial intelligence was a part of computer science specifically designed to design the automation of intelligent behavior in a computer intelligence system. According to Rich and Knight [1991], Artificial Intelligence (AI) was a study of how to make computers do things which currently humans could do better [4]. Intelligent system technology is created to facilitate human work and activities[4]. One technology which is being intensively developed is Artificial Intelligence. Artificial Intelligence or Intelligent system is the most important branch in the computer world. Computers are not only tools for calculating, but are expected to be empowered to do everything which is usually done by humans, such as having good knowledge, experience and reasoning abilities. In order for computers to act like and as well as humans, computers must also be equipped with knowledge and have the ability to reason.

Definition of Extractor

Extractor is a tool which is used to squeeze honeycomb which has high economic value. The development of the design and manufacture of this honey extractor is an improvement of tools owned by farmers in Sindang Pagar Village, West Lampung Regency. The tools currently owned have drawbacks, among others. They are still manual, they are not ergonomic, the time for squeezing the honeycomb is long, the honey yield is small, and it is difficult to move the tool. Researchers made improvements to existing tools

by referring to the concept of automation which collaborates on a frame player between a manual and an electric motor and makes a control mechanism using collaboration between a microcontroller and Android. Extraction is a type of separation of one or more materials from a solid or liquid. The extraction process starts from the agglomeration of the extract with the solvent. Contact occurs between the material and the solvent so that at the interface of the extraction material and solvent, mass deposition occurs by diffusion [5].

Extraction is the activity of withdrawing soluble chemical substances so that they are separated from insoluble materials with a liquid solvent. The active compounds contained in various simplicia can be classified into essential oils, alkaloids, flavonoids, and others. By knowing the active compounds contained, simplicia will facilitate the selection of the right solvent and extraction method (Wilda, 2013). Extractor is a tool used to squeeze honey or remove honey. Chemical components contained in organic materials such as those found in plants are needed by the needs of human life. Both components of these compounds are used for industrial purposes and for medicinal ingredients. These components can be obtained by an extraction method wherein extraction is a process of dissolving chemical components which are often used in organic compounds to dissolve these compounds using a tool.

Definition of Honey

Honey is a thick liquid produced by bees from flower nectar. Honey is also a sugar mixture made by bees from a natural sugar solution produced from flowers called nectar. Honey produced from bees which are accommodated by modern extraction methods is a clear liquid and free from foreign objects (Molan, 1999). Honey is a naturally sweet liquid derived from plant nectar produced by honey bees. Nectar comes from blooming flowers, plant fluids which flow in the leaves and bark of trees. After the nectar is sucked, the bees ferment it in their stomach by converting sucrose into glucose and fructose by the invertase enzyme from the throat. Honey is stored in the cells of the hive then honey will undergo water extraction, monosaccharide formation, and enrichment with aromatic mixtures. After three to seven days, the bees close the cells with a night which ripens the honey [6], Adji (2007).

Definition of Microcontroller

Microcontroller is a chip which functions as an electronic circuit controller and generally can store programs in it. Generally it consists of a CPU (Central Processing Unit), memory, certain I/O and supporting units such as an Analog to Digital Converter (ADC) which is already integrated in it. The advantage of a microcontroller is the availability of ram and supporting I/O equipment so that the size of the microcontroller board becomes very large. concise. The microcontroller is arranged in a single chip where the processor, memory, and I/O are integrated into a single control system so that the microcontroller can be regarded as a mini computer which works innovatively according to system requirements. Microcontroller can also be called a digital electronic device which has input and output as well as control with programs which can be written and erased in a special way. The way of microcontroller actually works is to read and write data. Arduino is an electronic kit or open source electronic circuit board in which the main component is a microcontroller chip with the AVR type from the Atmel company. The microcontroller itself is a chip or IC (Integrated Circuit) which can be programmed using a computer [7]. Microcontroller is a chip which functions as an electronic circuit controller and generally can store programs in it, Fauzi (2011).

Arduino is a platform which consists of software and hardware. Arduino hardware is the same as a microcontroller in general. It's just that the arduino added pin naming to make it easy to remember. Arduino software is open source software so it can be downloaded for free. This software is used to create and enter programs into Arduino. Arduino programming is not as many stages as conventional microcontrollers because Arduino has been designed to be easy to learn, so beginners can start learning microcontrollers with Arduino, Sulaiman (2012). Arduino microcontroller is an electronic kit or electronic circuit board which is open source and consists of Arduino software and hardware. This software is used to create and delete programs which are in the Arduino processor and can be easily learned for beginners. The purpose of embedding the program on the microcontroller is so that the electronic circuit can read the input, process the input and then produce the desired output. So, the microcontroller serves as the 'brain' which controls the input, process and output of an electronic circuit.

Definition of Android

Android is a Linux-based operating system for mobile phones such as Android smartphones and tablet computers which provides an open platform for developers to create their own applications for use by various mobile devices. According to Safaat (2011), Android is a collection of software for mobile devices which includes an operating system, middleware and main mobile applications. Android is built to be completely open so that an app can invoke any of the phone's

core functions like making calls, sending text messages, using the camera and more. Android uses a specially designed virtual machine to optimize the memory and hardware resources contained in the device. Android is an open source which can be freely extended to satisfy new, more advanced technologies. When these technologies emerge, this platform will continue to be developed to build more innovative mobile applications[5]–[8].

According to Hermawan (2011: 1), Android is a Mobile OS (Operating System) which is growing in the midst of other Operating Systems which are developing today. Other Operating Systems are Windows Mobile, i-Phone OS, Symbian, and many more. However, the existing of Operating System runs by prioritizing core applications which are built by themselves without seeing the considerable potential of third-party applications. Therefore, there are limitations of third-party applications to obtain native mobile data, communication between processes and limitations of distribution of third-party applications for their platforms. According to Nazaruddin (2012:1) Android is an operating system for mobile phones based on Linux. Android provides an open platform for developers to create their own applications for use by various mobile devices. Android is commonly used in smartphones and tablet PCs. Android is a Linux-based operating system which is currently being developed among other Operating Systems. Android is a Linux-based mobile device operating system which includes an operating system, middleware and applications. Android provides an open platform for developers to create their applications[9]–[11].

Internet of Things (IoT)

IoT is a concept which is currently popular. The background of the Internet of Thing concept is how every object in our daily lives can be connected to the internet network and where objects can send data to the internet and we can access it from anywhere and anytime[12]–[14].

1. System Automation In addition to monitoring, the Internet of Things also allows an object to automate itself. Objects can process their own data obtained from sensors on themselves, then process these inputs to make decisions.
2. Web Server Design In the web display design section is carried out based on the needs of the system to be created. A web server is a software which provides data-based services and functions to receive requests from HTTP or HTTPS on a known client which we usually know as a web browser.

III. RESEARCH METHODS

Method of collecting data

The method used for the data needed in this process is:

Observation

According to Suryana (2010: 51), Observation is an effort to observe and document things which happen during the action. According to Sugiyono (2011:10), Observation is the collection of data through direct observation or careful and direct observation in the field or research place.

Documentation

The technique of collecting data with the documentation method is a way of finding data or information from books, notes, transcripts, newspapers, magazines, inscriptions, meeting minutes, agendas and others. (Jusuf Soewadji, 2012: 160). Documentation is a record of events which have passed in the form of writing, or pictures of a person by collecting notes and collecting data. To get the required data, the author also looks at the available data documentation.

Interview

Soewadji jusuf (2012:12) said that the interview is a method of collecting data face to face directly with the interviewee. According to Suryana (2010:16), interview is a meeting of two or more people to exchange information and ideas through question and answer so that meaning can be constructed in a particular topic. Interview is the process of collecting data by way of question and answer with the resource person. This means that the question comes from the interviewing party and the answers were given by the interviewees. In this method the author directly conducted a question and answer with several owners of honey farmers.

Literature review

Sugiyono (2011:13) says that literature study is a method of collecting data through scientific sources from the literature or from books which are relevant and support research. According to Soewadji Jusuf (2012:14) “Library study is a method of collecting data by searching for information through books, newspapers and other literature. Literature study is a method of collecting data by reading literature or books in the library. In this case the data collection is done by reading and studying writings in the form of literature books and other reading sources related to the object of discussion as a theoretical basis.

Development and Problem Solving Method

The system development method used in this research is the waterfall method. Tata Sutabri

(2004:62) states that the implementation of the stage development stage must be completed first in full before proceeding to the next stage to avoid repetition of stages.

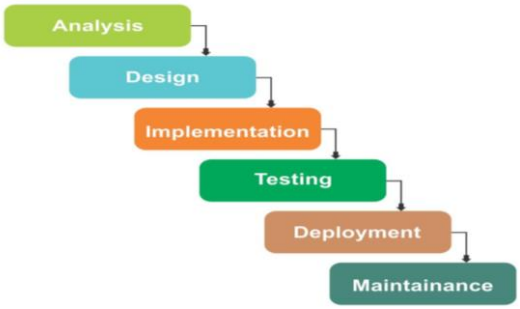

Figure 1. Waterfall Method Development Structure

Waterfall Method Stages:

1. **Survei Sistem**
   Survei Sistem is collecting complete requirements then analyzed and defined the needs which must be met by the software to be built. This is very important, considering that software must be able to interact with other elements such as hardware, databases, and so on. This stage is often called Project Definition. The author conducted a survey to the object of research to obtain the data needed in the manufacture of applied technology for the honey extractor intelligent system. The data is in the form of the location of the breeder and the type of honey cattle which are cultivated.
2. **System analysis**
   Collecting data at this stage can conduct an interview research or study literature. A system analysis person digs up as much information as possible so that a computer system will be created that can perform the tasks desired by the user. This stage produces data related to the wishes of the user in making the system. This document is the reference for the analysis system to translate it into a programming language.
3. **System Design**
   The design process translates the requirements of a software planning system which can be estimated before coding. This process focuses on data structure, software architecture, interface representation, and procedural details. This stage produces a document called Software Requirements. This document is used by the programmer to carry out the activities of making the system.
4. **System Build**
   This stage converts what has been previously designed into a language which the computer understands. Furthermore, the computer carries out the functions which have been defined so that it is able to provide services to its users. At this stage the author makes a system using a programming language which can be understood by computers, so that it can provide services to users.
5. **System Implementation**
   This stage can be said to be final in making a system. After analyzing, designing and coding, the finished system can be used by users.
6. **System Maintenance**
   Software which has been delivered to users will definitely experience changes. These changes can be due to errors because the software must adapt to a new environment (new peripherals or operating systems) or because users need functional development. The author feels the need to carry out maintenance on the new system, so that the quality of the system is maintained, for example, periodic tool repairs, adding features so that the system is more developed, updating the interface and so on.

IV. DISCUSSION

Intelligent System Flow Design

Squence diagram

This is a diagram which depicts the interaction of objects which indicate (show or sign) the communication between these objects. Squence diagram is used to describe the behavior of a scenario and describe how the entities in the system interact, including the messages used in the interactions.

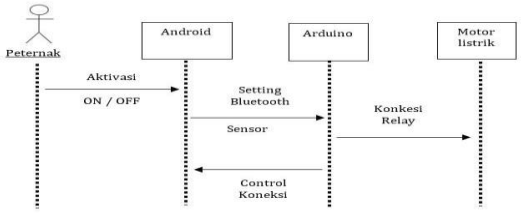

Figure 2. Squence Diagram of Automatic Honey Extractor

Colaboration diagrams

Collaboration diagrams are diagrams which group messages on a set of sequence diagrams into a diagram. In the diagram, there are methods which run between one object and another. Collaboration diagrams are perfect for depicting simple interactions for relatively small quantities of objects.

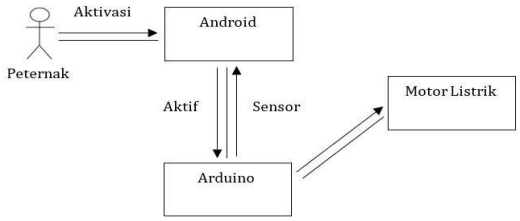

Figure 3. Honey Extractor Collaboration Diagram

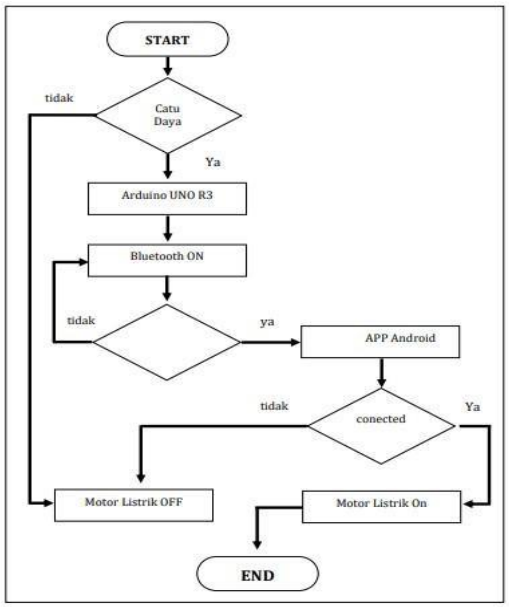

Figure 4. Flowchart of how the honey extractor machine works

Design of Main Page Software

When a user opens an application, the user will be presented with several menus found on the main page of the application. The main page design in this application is:

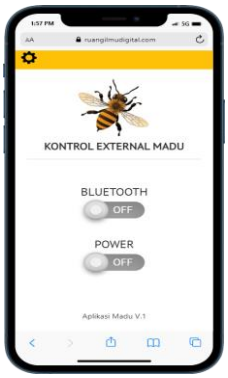

Figure 5. Design of the Application Main Page

Design of Bluetooth connection selection page

The product page contains the results of the Bluetooth device network available on the smartphone device. The pairing menu design in this application is:

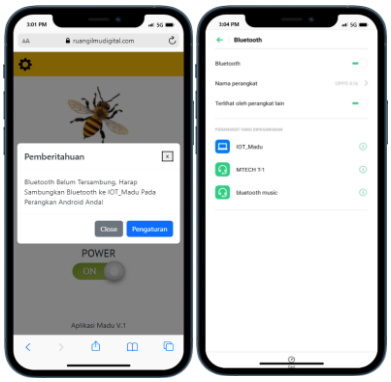

Figure 6. Page of Bluetooth Selection Menu

Application display after connecting bluetooth

When the user opens the application and is connected, the user is ready to operate the microcontroller and Android-based honey extractor automation tool. The display that the device is connected:

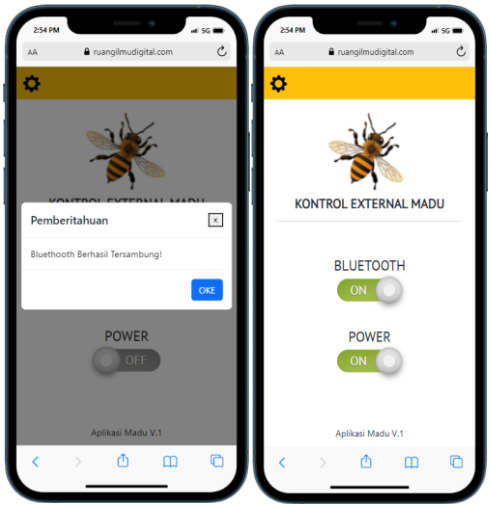

Figure 7. Design of the Connected Bluetooth Page

Display of the tool design scheme

The design scheme for the tool designed is:

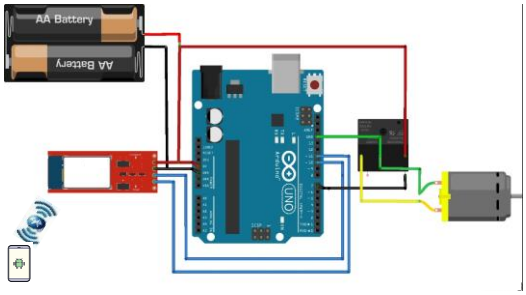

Figure 8. Schematic of Control Diagram

The following are the names of the tools used in designing the tools:

a) Android
b) Arduino Uno Microcontroller
c) Power Supply Or Battery
d) Bluetooth Module HC-05

e) Relay Module
f) Electric Motor

The following is an explanation of the microcontroller-based control circuit:

If someone performs an order from Android using an application with the aim of turning on the load / electric motor, the Bluetooth Module will convert the data into an electrical signal which will then be processed into ground, vcc, signal, and will then go to the microcontroller. After processing, the microcontroller provides a signal in the form of an input of 5 volts, ground, and an instruction signal to turn on the electric motor through a relay module with 1 channel. Input from the relay with 3 connecting terminals including: Vcc 5 volts (+), ground (-), signal (0/1) with outputs vcc (+) and NO (Normally Open), the output from vcc is connected to PLN 220 volts. And in principle, if the relay is given a voltage, the terminal from NO at the output will be closed/connected (Normally Close), then the voltage will enter the load (electric motor) and the wiring phase directly to the electric motor and immediately the electric motor will turn on.

Coding Writing
Arduino coding

To make a program requires a computer as a tool. What we need to pay attention to is what program we will use to create the program. Control system using arduino uno used arduino ide program. The reading of the program is:

a) To run the Arduino IDE software, it must first be installed on the computer. Once installed, it can be opened by going through the start menu and then selecting Arduino IDE. Arduino IDE will open with an interface as shown in Figure 4.2-18:

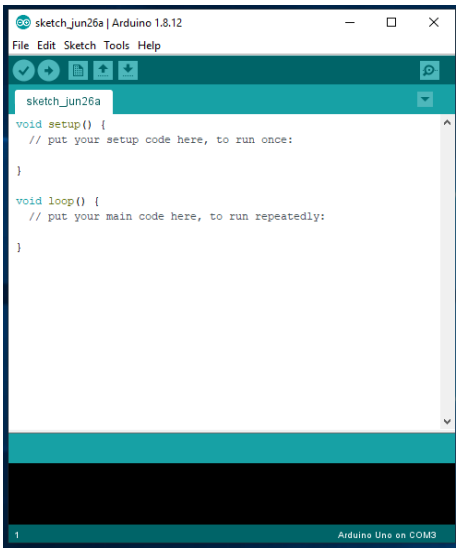

Figure 9. Interface of Arduino IDE Software

b) After finishing programming the sketch, we can immediately run the program by clicking the Verify symbol or from the sketch menu selecting Verify/ Compile or it can also be done with the shortcut Ctrl + R. If verify is successful, there will be the words Done Compilling.
c) Once verified, the sketch can be directly uploaded to Arduino by clicking the upload symbol or from the file menu select Upload or you can also use the Ctrl + U shortcut as shown below. The things which need to be considered are that we must first check which communication port is connected to the Arduino and the USB port must match the settings in the sketch. The trick is to select tools - serial port. In addition, the choice of the type of Arduino must also be set. Select tools – board – and select the type of arduino you are using. If the file has been uploaded perfectly, there will be a Done Uploading status. It can be seen in Figure 4.2-19.

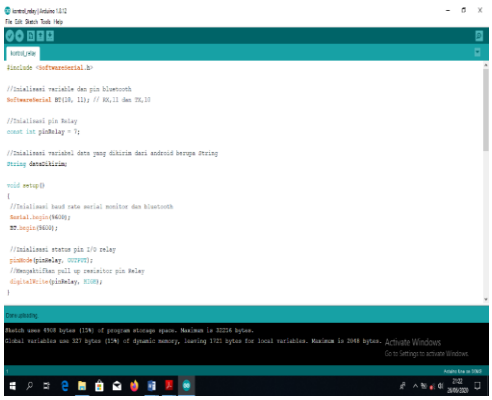

Figure 10. Uploading Process Complete

V. CONCLUSION

From the results of the implementation of the honey bee extractor, it can be concluded that the appropriate technology for the intelligent system can increase the efficiency of honey bee production for ± 14 days of harvest because the bees no longer have to build nests so they can immediately produce. By applying honey bee extractor automation technology, it can increase the productivity of human resources in terms of time efficiency and increase the economic value of honey bee production. Arduino technology using an intelligent system has proven to be more productive than conventional harvesting systems by human labor.

REFERENCES

[1] N. Sri, N. Fitri, J. H. R. Soebrantas, N. Km, S. Baru, dan P. Pekanbaru, "Perancangan Ulang Alat Pemeras Madu (Studi Kasus : Kecamatan Tapung Kabupaten Kampar Riau) Jurusan Teknik Industri Fakultas Sains Dan Teknologi Uin Suska Riau," vol. 12, no. 1, hal. 16–22,

2014.

[2] A. Syakhroni dan N. Khoiriyah, "Improving The Performance of Honey Extractor Through Tool Automation and Ergonomics Design for Honey Bee Farmer in Batang," *J. Keteknikan Pertan.*, vol. 05, no. 3, hal. 1–11, 2017.

[3] R. Munarto, "Sistem Pakar Diagnosis," vol. 14, no. 1, hal. 75–86, 2018.

[4] D. K. Buatan, "(ARTIFICIAL INTELLIGENCE)," hal. 1–5, 1991.

[5] S. Rahayu, "Isolasi Pektin dari Kulit Pepaya (Carica papaya L.) dengan Metode Refluks Menggunakan Pelarut HCl Encer," *J. Chem. Inf. Model.*, vol. 53, no. 9, hal. 4–31, 2017.

[6] N. H. Board, "National Honey Board," no. 303, hal. 1–3, 2007.

[7] D. Yulianti, "Aplikasi Simulasi Laporan Keuangan Pribadi Berbasis Android," *Apl. Simulasi Lap. Keuang. Pribadi Berbas. Android*, hal. 6, 2017.

[1] A. Maseleno, M. M. Hasan, M. Muslihudin, dan T. Susilowati, "Finding Kicking Range of Sepak Takraw Game: Fuzzy Logic and Dempster-Shafer Theory Approach," *Indones. J. Electr. Eng. Comput. Sci.*, vol. 2, no. 1, hal. 187, 2016.

[2] A. Maseleno, N. Tuah, dan C. R. Tabbu, "Fuzzy Logic and Dempster-Shafer Theory to Predict the Risk of Highly Pathogenic Avian Influenza H5n1 Spreading Computer Science Program , Universiti Brunei Darussalam , Faculty of Veterinary Medicine , Gadjah Mada University , Indonesia," *World Appl. Sci. J.*, vol. 34, no. 8, hal. 995–1003, 2016.

[3] A. Maseleno, G. Hardaker, N. Sabani, dan N. Suhaili, "Data on multicultural education and diagnostic information profiling: Culture, learning styles and creativity," *Data Br.*, vol. 9, hal. 1048–1051, 2016.

[4] A. Maseleno dan G. Hardaker, "Malaria detection using mathematical theory of evidence," *SJST*, vol. 38, no. 3, hal. 257–263, 2016.

[5] J. Liu dan Y. Zhang, "Implementation of information-based teaching system for young college teachers based on iOS platform," *Int. J. Emerg. Technol. Learn.*, vol. 12, no. 8, hal. 14–26, 2017.

[6] A. Alenezi, "Checking on preferential choices of e-learning & mlearning: A case study of Northern Border University, Saudi Arabia," *Int. J. Emerg. Technol. Learn.*, vol. 12, no. 5, hal. 98–116, 2017.

[7] X. Jing, "Multimedia Teaching Platform Design for Urban Planning Course Based on Information Entropy Research progress," *iJET*, vol. 12, no. 7, hal. 4–16, 2017.

[8] B. D. Satoto dan E. Rahmanita, "Integrasi Augmented Reality Pada Mobile Virtual Tour Berbasis Android Untuk Pencarian Lokasi Dan Rute Terdekat," *J. Ilm. Mikrotek*, vol. 1, no. 1, hal. 59–66, 2013.

[9] Y. Chalri, H. Rasjid, dan T. Basyir, "Aplikasi informasi tabel periodik unsur kimia berbasis android," *SEMNASTEKNOMEDIA*, vol. 1, no. 1, hal. 33–38, 2013.

[10] W. W. W. Eko Sulistiyo Wibowo, Adhi Susanto, "Kesiapan Pengguna Intranet Berbasis Android Di Kementerian Perindustrian," *SEMNASTEKNOMEDIA*, vol. 2, no. 1, hal. 31–36, 2014.

[11] M. Maimunah, D. Supriyanti, dan H. Hendrian, "Aplikasi Sistem Order Online Berbasis Mobile Android Pada Outlet Pizza Hut Delivery," *Semin. Nas. Teknol. Inf. dan Multimed. 2017*, no. ISSN : 2302-3805, hal. 4–5, 2017.

[12] U. E. Unggul dan K. Jeruk, "Studi Literatur : Analisis Privasi Pada Internet of Things," hal. 8–9, 2018.

[13] C. M. Carbery, R. Woods, dan A. H. Marshall, "A New Data Analytics Framework Emphasising Pre-processing in Learning AI Models for Complex Manufacturing Systems," in *Intelligent Computing and Internet of Things*, 2018, hal. 169–179.

[14] F. M. Córdova, C. Durán, dan R. Galindo, "Comparative analysis of ICT in public – private systems : The OHIM case in the European Union and the Internal Revenue System in Chile .," *Procedia - Procedia Comput. Sci.*, vol. 31, hal. 95–104, 2014.