Learning Media Application Based On Microcontroller Chip Technology in Early Age

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Abstract. In Early childhood cognitive intelligence need right rncdia learning that can help a child's cognitive intelligence quickly. The purpose of this study to design a learning media in the form of a puppet can used to introduce human anatomy during early childhood. This educational doll utilizing *voice recognition* technology from EasyVR module to receive commands from the user to introduce body parts on a doll, is used as an indicator TED. In addition to providing the introduction of human anatomy, this doll $_{jut.}$ a user can give a shout out to mainly play previously stored voice module *sound recorder*. Results obtained from this study is that this educational dolls can detect more than voice and spoken commands that can be random detected. Distance concrete of this doll in detecting the sound is up to a distance of 2.5 meters.

1.Introduction

Education is an important asset for the progress of a nation; therefore every citizen must follow many levels of education both level of education of children ages. early childhood, basic education, secondary education and in the field of education of a child from birth require appropriate services in the fulfilment of educational needs, understanding of the characteristics of children according to their growth and development will be very helpful in adjusting the learning process for children with age, needs, and condition, respectively, both intelegencially, emotionally and socially. In early childhood development, parents experience many challenges in their child's education process. Cognitive knowledge such as the introduction alphabets and numbers, children also need to start recognizing part of their bodies. Parents usually train their children by saying the name and designate one member of the body to the late children can recognize what the name of limb designated, because the learning process of children mainly under the age of three years started off with seeing, hearing, and utter words. with imitate what was heard by him. In addition to learning, giving it time to play for children is also very important in the learning and development of their emotional, so it would be nice if the parent gives the right toy and educate their children, so that the children can learn while playing. A doll is a kind of toys with various kinds of shapes begins to humans, animals, and a fictional character. In general, dolls are used as children's toys and sometimes also used as a collection as well as a friend for doll fans. Of course, the existence of this one toy is very close to human life, especially children. Therefore, there is an opportunity to develop the great benefits of the doll one of them by insert the value of education.

To be able to design a doll. who can help parents in providing education to. his children, about the introduction of the anatomy of the human body. and how to pronounce the part of the body. Correctly, then required the role of technology in it, namely with the help of Voice Recognition technology. This Voice Recognition technology enables a device to recognize and understand the words spoken by the user. With using microcontroller ATmega328 as the central data processing and module Voice Recognition EasyVR as a sound sensor that is not only able to detect the presence of noise, but also be able to recognize words or sentences, doll education expected to be able to recognize words spoken by the parents and the child, for example when the parents of the child say the eyes ", then the LED light as a pointer to the puppet eye will light. In addition to teaching recognize the human anatomy, this doll is also said to teach children how to introduce themselves well, ie when parents say" hello ", then stuffed. Education will be answered by playing a sound." hello"stored in the module Sound Recorder.

2. Support Theory

2.1 Definition Media Learning

Medium term is derived from the Latin word is the plural of "medium", which literally means an intermediary or introduction [I]. Media is every something that can distribute information on resources to the recipient of the information learning process is also essentially a communication process, so that the media used in learning called learning media. Learning media is part of the learning resource merup will be a combination of software (learning materials) and hardware (learning tool). From the above understanding, in general it can be said that the substance of learning media is a form of the channel, which is used to distribute messages, information or material subject to the recipient of the message a.tau learners can also be said that the learning media is type of various components in the environment in which learning environment can stimulate learners to learn.

2.2 Microcontroller

Microcontroller CT is the main controller electronics devices today, including the robot course. [2]. Microcontroller famous and easy to get in Indonesia today is 89S51, ATMega AVR 8535, ATMega 16 ATMega 32, and ATMega 128. Another famous brands, such as PIC 16F877 and Basic Stamp microcontroller 2. Include a processor core, memory (a small amount of RAM, program memory, or both), and input and output equipment. In other words, the microcontroller is a digital electronic device that has inputs and outputs as well as control with a program that can be written and erased in a special way, the workings of the actual microcontroller to read and write data. Microcontroller is in the computer *chip* used to control electronic devices, which push and effectively costs. As literally be called "little control" where an electronic system which previously was often require components supporting components such as TTL and CMOS IC can be reduced minimized and centralized and controlled by the microcontroller [3]. ATmega328 is output from Atmel microcontroller that has a RISC architecture *(Reduce Instruction Set Computer)* wherein each execution process data faster than CISC architectures *(Completed Instruction Set Computer)* [4].

2.3 Voice Recognition

Voice Recognition Technology is a speech recognition technology that use human voice as an input signal for later identified by computer system. The technology is the development of interaction between human and computer equipment to minimize output *device* such as *a mouse, keyboard* and other *technological* equipment [5], technology allows a device to recognize and understand the words spoken by way of digitizing the word and match the digital signal with a specific pattern stored in a device. Word spoken, words transformed into a digital signal by converting sound waves into a set of numbers which are then adapted to the specific code for identify these words. Device Voice Recognition requires a sample of the actual words spoken from the user. The word sample will be digitized and then inserted in the computer. Then used as the database in the next match spoken words. Most of its speech recognition device is still dependent on the loudspeakers. This device can only recognize spoken words from one or two people and can only recognize separate words, i.e. words in his delivery there are pauses between words. Only a small part of devices using this technology that is not dependent on Loudspeaker. These devices can recognize spoken words and also many people can recognize continuous words, or words in their delivery. There are no pauses between words [6].

2.4 EasyVR

EasyVR as shown in Figure 1 is a multi-function recognition module that can be used in many control applications that require the detection of not only say yes noise but conversations [7], can be used *host* EasyVR module with UART interface, powered on. DC 5V working voltage 3.3V-, such as PIC and Arduinno board. This module is ideal for EasyVR k diverse applications such as home automation.

Figure 1. Module EasyVR

Compared with other sensor module sound like a sound sensor LM386, this EasyVR module not only detect the presence. sound waves, but also can detect words. or sentences spoken by the user by means of digitizing the word and match the digital signal with a pattern. certain stored in a device.

3. System Design

3.1 Design of Hardware and Software

The design of this educational puppet divided into two parts: the design of hardware and software. Hardware design consists of a *box* component assembly installation *drui* LED on the body of the doll. As for the software design using programming languages used to translate the input received by the sensor. and then will generate output LED lights turn on and play voice on the *sound recorder.*

3.1.1 Hardware Design

The dolls are used in designing this educational doll-shaped stuffed is a human which have dimensions Some of the electronic components used in the design of the system of education in order dolls education designed IIU able to receive voice commands from the user. The components used are as follows:

1. EasyVR

Used as a sensor to detect voice command of user, where in the sensor supports up to 32 *user-defined* voice commands.

2. ATMega328 Microcontroller

Used as a data processing center. This microcontroller 110 pin total of 14 pins, 6 of which PWM (*Pulse Width Modulation) output,* and 32 KB *Flash memory, T3 Sound Recorder SD182.0*
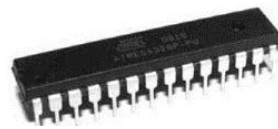

Figure 2. The microcontroller ATmega328

Module is used as a voice recorder or sound *recording module,* this module is also used to play a sound that has been stored previously.

Figure 3. Sound Recording Module IS 1820

4. LED

LED lights here is used as a pointer doll body parts ordered.

5. Lithium Battery Polymer

Used as voltage source for the microcontroller, *Voice Recognition module, sound recorder,* and an LED. The battery used has a 1000mAh power with a voltage of 11.1 volts, for components such as microcontrollers, modules *Voice Recognition, Sound Recorder,* and the battery will be placed on a box component is placed inside the body of the doll.

3.1.2 Software Design

The software in this system using the application as a programming center is using the Arduino IDE software with the Arduino programming language is the C language is easy to use functions that are simple so that it can learned easily. Application serves as place of making the source code which is then uploaded to the microcontroller is present on the system. So the system can run as expected.

1. The initial process begins by initializing the system as EasyVR module, LED pin, and pin Sound Recorder.
2. Then make sure the EasyVR module condition is already connected,
3. If you are connected, the Sound module Recorder turned on, while all LED light stays off,

4. For conversation, if EasyVR module detects the word "Hello", then Sound Recorder module will play a sound "Hello what, are you", And if EasyNTR detect phrase "Who is your name", Then the Sound module Record play voice "My name is Alphabete".
5. For the introduction of parts of the body, if the module detects words namely EasyVR "Nose".
    "Mouth", "Ear", "Head". "Neck", "Body". "Hand", "Legs", then the LED lights on the part of the word detected bodies will light.

4. Testing

After assembling the tools and system configuration, the next step is performing tests to analyze and determine whether the system can run as expected.

4.1 EasyVR Working Tests

Tests were conducted to determine how working voltage of the sensor noise when receiving voice commands. Working voltage of the sensor is 8 volts EasyVR sound coming from Lipo battery contained in the system, such as image input voltage testing using a measuring instrument AVO meter in Figure 4 below.

Figure 4. Measurement *input* voltage EasyNIR

4.2 Testing Commands Sound

First, testing command voice done by testing the response of the LED and sound recorder by saying a command phrase always. sequentially, namely: Hello, what's your name, eyes, nose, mouth, ears, head, neck, torso, arms, and legs. To begin testing this educational doll, first to do is turn on the system by pressing the switch that is on the edge of the box components. After the indicator lights up command receiver, then uttered the first trigger is the word "doll", in order to further the system can receive commands in the group as in Figure 5 below.

Figure 5. Voters response Dolls

If all the LED light as shown above, then the system can receive commands in the group, which is the first LED response when it detects the word "eye" In the picture, the LED portion of the eye responds without repetition pronunciation of command. Further testing LEDs response for the word "nose". From the test results all the voice commands, all command specified is already onshore (giving the corresponding output, but there word commands that require 1 to 3 repetitions to provide outputs, it also due to a lack of clarity when pronouncing words or phrases such order. To test a second voice command is done by testing the response of the LED and Sound Recorder to pronounce the word or phrase random order. The test results are shown in Table 1 below.

Table 1. **Results of Tests Recurrence Randomized**

NO	Command	Response	Repetition
1	**Neck**	**LED ON**	**1**
2	**Eye**	**LED ON**	**0**
3	**Feet**	**LED ON**	**0**
4	What is your name	Sound Recorder ON	
5	**Body**	**LED ON**	**1**
6	**Nose**	**LED** ON	**2**
7	**Head**	**LED ON**	**1**
S	**Mouth**	**LED ON**	**0**
9	**Hand**	**LED ON**	**1 ,**
10	**Ear**	**LED ON**	**-**
11	**Hello**	**Sound Recorder ON**	**0**

From the test results a second voice command, it can be seen that the system is capable of receiving commands

4.3 Testing Distance Sumbe r Sounds
This test is used to evaluate the response of the system based, distance of the sound source when pronouncing the word command, in this test using one word commands that eye, and this test is conducted in a room with difficult conditions. Results of the testing are presented in Table 2 below.

Table 2. **Result Recognition of Sound Source Distance**

NO	Distance	Assessment				
		I.	2	3	4	5
1	0.5 meters	0	0	0	O	0
2	1 meters	0	*O*	*0*	0	0
3	1.5 meters	0	O	O	O	0
4	2 meters	O	O	O	O	O
5	2.5 meters	0	0	0	0	O
5	3 meters	0	X	X	0	X
-	3,3 meters	O	X	X	X	0
g	4 meters	X	X	X	X	X

Description: 0 = Success X = Fail

From the results of tests performed, it is known effective distance education dolls in detecting a command word that is up to a distance of 2.5 meters, 2.5 meters More of sensor sensitivity is reduced and if a larger distanceof 3.5 meters to 4 meters sensor can not be detects spoken word commands.

4.4 Voice Testing Different

Testing was conducted to determine whether the system can detect more than one voice. In this testing use one word command is the word hello and testing is done with 3 types of different sound, the voice of men, women, and children. From the results of tests performed, the voice of women and children more failure, It caused by tone of voice in women and children. High child, while at the time of recording the voice command using voice men who have a low tone of voice

4.5 Battery Testing

Tests on these batteries are done to determine how long this educational dolls can be used. In peng, a battery test is divided into two types testing, namely:

1. No-load battery test (standby doll). In the no-load battery testing writer use digital measuring instrument for measuring current and voltage input to the system microcontroller connected to the overall system.Testing the battery power is intended to determine time in units of the battery is used up. The results of testing these batteries can result in no-load measurement system when (the doll in standby) is 70mA or 0.07A so if included in the formula be:

Time (t) = Current 1 battery load current Time = 1000 $^{-}$ mA / 70mA
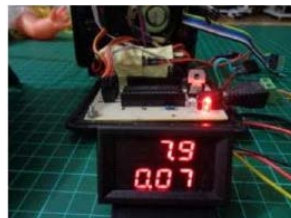Time (t) = 14.2 hours

Figure 6. No-load battery testing

Testing the battery to the load (puppet reading voice commands).
Natural battery testing with a load of author use digital measuring instrument for measuring the flow and input voltage microcontroller system connected to the overall system. Testing the battery power is intended to determine how much time in other units until the battery is used up. Hasi1 of this battery test can result in measurement when the system load (puppet reading voice command) that is equal to 310mA or 0,31A so if included in the formula becomes:

Time = Current load current Battery 1 time = 1 000mA / 310mA
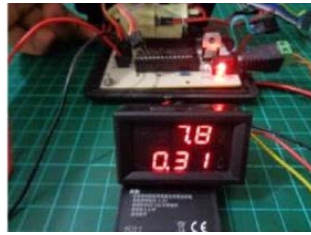Time (t) = 3.2 hours

Figure 7. Battery testing with load

5. Conclusions

Based on the research result have been performed, it can be concluded like the following:

1. Designing draft educational doll *voice recognition* rbasis be done with a few step namely, designing component *box,* mounting the LED on the body of the doll, and determining which words or sentences acceptable whole system.

2. Sound recorders and LED module on the body of the doll can respond properly EasyVR sensor detects voice commands up to a distance of 2.5 meters, but sometimes it can take 1 to 3 times the repetition pronunciation order to provide a response.

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