DETECTOR COLOR AND NOMINAL MONEY SYSTEM FOR BLIND BASED ARDUINO UNO.

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Abstract. In general, the color variable measurement performed using LDR or phototransistor. Color composed of basic colors, one for light with its constituent basic color is red, green and blue (RGB), while parameter color has a different wavelength of light. With the development of electronics technology now allows the detection or measurement of color is based on basic colors making up one of them using sensors TCS3200. This research is to design a device for detecting color and nominal money based arduino uno and TCS3200 sensors that utilize current changes in proportion to the parameters of the basic colors of light that happened and then the current is converted into a signal box with a frequency proportional to the magnitude of the current. The test results showed that the accuracy of the instrument is functioning properly, it is based on the sensitivity of the sensor TCS3200 color against color light to frequency conversion is good for white, black, primary colors and secondary colors and color found on banknotes. Then, as compared with the calibration readings readings eat its output value will be displayed by the LCD and mini DFPlayer as the outcomes of the vote. Dfplayer mini utilize external memory SD card as the storage of data which will be played

Keywords: Arduino Uno, TCS 3200, LCD and mini DFPlayer.

I. INTRODUCTION

Eyes is a prayer One senses That is very important functions For That Man as the sense of sight. ON is essentially sensitive eyes against the light and color. For a review can be Seeing color spectrum of light through the eye Then Must have the ability to review the basic fundamentals Namely distinguish color RGB (red green blue) Accurate operates. The development of Science and Technology provides The big Impact For Human Life Now singers, especially in the field of telecommunications technology. The application of telecommunications technology PESAT Very help Human Life hearts did ACTIVITIES Human activities and particularly addressed to the society needs SPECIAL.

Survey According to Indra Vision And Hearing Year 1993 - 1996 shows the figure of blindness in Indonesia 1.5% High paled in Asia, compared WITH Bangladesh 1%, India 0.7% and Thailand 0.3%. This means that 12 of World Population IF THERE ANY 1 hour blind hearts, four of which came in from Southeast Asia and is certainly one person from Indonesia. Main cause of blindness is cataract (0.78%), glaucoma (0.20%), refractive errors (0.14%), and diseases lie Related BY advanced age (0.38%) .. Central Bureau of Statistics reported that aT 2025 Elderly Population INCREASED BY Become 414% compared to 1990. And 'the Indonesian people tended to suffer 15 years sooner than patients in region of subtropis.

Sensors emergence of increasingly sophisticated electronic world today can support people to make software. Humans are expected to make the software used to support hardwae-hardware to be a highly sophisticated system and certainly very useful to facilitate the job of man, especially the blind.

Paper money is a means of payment for goods and services that we often use in the world of buying and selling. Money as a tool in the transaction have been used by all people in every corner of the world, did not escape also persons with disabilities such as visual impairment, for example. Viewed from that, based on the limitations of the blind have, it is likely to be confused, one take, and also there are ignorant people who will take advantage of their weaknesses in the use of the money.

Referring to the above problems, it is necessary to design a simple tool for the blind that uses a color sensor on the system as the identification of the nominal value of banknotes and color by detecting the color of paper money and the colors. It is expected to facilitate the visually impaired in the activities of transactions in goods, services and identify the type of color.

In connection with this background, the authors designed a final report with the title "Color Detection System and Nominal Money For Blind People Base to ArduinoUno"

II. LITERATURE REVIEW

Arduino is a Single Board controlling micro is an open source derived from wiring platform designed to facilitate the use of electronics in various fields hard ware in arduino have an atmel AVR processor and use the soft ware and its own language.
Hardware in arduino has some kind , which has advantages and disadvantages in each of his board . Use of genius sarduino tailored to the needs , it will affect on the type of processor used . If more complex design and program were created , it must conform pulajenis digunakan.Yang controller distinguishes between arduino with each other is the addition of functions within each of its board and the type of microcontroller used . In this Sakhir tuga , the type used is arduino arduino uno.
According to Abdul Kadir (2013 : 16) , Arduino Uno is one of the products labeled arduino which actually is an electronic board containing a microcontroller ATmega328 (a puck that functionally acts like a computer) . This tool can be used to realize the electronic circuit from the simple to the complex . LED control to control the robot can be implemented using a relatively small -sized boards . Even with the addition of certain components , this device can be used for monitoring the condition of patients in hospitals and control of the means at home.

Table1.*Index Board Arduino*

Microcontroller	ATmega328
Operating Voltage	5V
Suggested input voltage	7-12V
Limit the input voltage	6-20V
Number of pin I / O digital	14 (6 of which provides a PWM output)
The number of analog input pin	6
DC current of each pin I / O	40 mA
Pin 3.3V DC current	50 mA
Flash memory	32 KB (ATmega328) , approximately 0.5 KB used by bootloader
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

(Source : B. Gustomo , 2015)

Figure 1.*Arduino Uno* (Source: B. Gustomo, 2015)

Hardware arduino uno have the following specifications:
a. 14 pinIODigital (0-13 pin)
Some digital pin with 0-13 numbers that can be used as input or output is regulated by making the IDE program
b. 6 pinInput Analog (pins 0-5)
Some pin analog numbered 0-5 which can be used to read the value of analog input values and transform it into a number between 0 and 1023.
c. 6 Analog Output pin (pin3, 5, 6, 9, 10 and 11)
Pin number is actually a digital pin but the number of pins can be programmed kembal imenjadi analog output pin by making its program in the IDE.

Arduino Uno board can take power from the USB port on the computer using a USB charger or can also take power by using an AC adapter with a voltage 9volt.Jika there is no power supply via the AC adapter, the Arduino board will take power from the USB port.Tetapi when given power through the AC adapter together with a USB port, the Arduino board will take power through the AC adapter automatically.

Arduino software used was the driver and IDE , although there are still some other software which is very useful for the development of arduino . Integrated Development Environment (IDE) , a special program for a computer to be able to make a design or sketch program for the Arduino board . Arduino IDE is a very sophisticated software written using arduino java.IDE consists of :
Editor
Program A window that allows users to write and edit in a language processing program .
Compiler
Serves to compile a sketch without uploading to the board can be used for error checking code syntax sketch . A module that converts the source code into binary code a microcontroller however will not be able to understand the language processing .
Uploader
Serves to upload the sketch compilation to a target board . The error message will appear if the board is not installed or COM port address is not configured properly . A module containing the binary code of computer software into memory in the arduino board .

III. METHODOLOGY

The tool used is the Arduino Uno and TCS3200 and sensors, which utilize current changes in proportion to the parameters of the basic colors of light that happened and then the current is converted into a signal box with a frequency proportional to the magnitude of the current.
This research is to design a device for detecting color and nominal money
The test results showed that the accuracy of the instrument is functioning properly, it is based on the sensitivity of the sensor TCS3200 color against color light to frequency conversion is good for white, black, primary colors and

secondary colors and color found on banknotes. Then, as compared with the reading of the readings calibration value then the outcome will be displayed by the LCD and mini DFPlayer as the outcomes of the vote.
Dfplayer mini utilize external memory SD card as the storage of data which will be played
In this study, the simulation is restricted to models of color detection and nominal money as follows:
Color Detection

Table2. Values Frequency and Wavelength Color

Color	Frequency	Wavelength
Indigo-Purple	668–789 THz	380–450 nm
Blue	606–668 THz	450–495 nm
Green	526–606 THz	495–570 nm
Yellow	508–526 THz	570–590 nm
Orange	484–508 THz	590–620 nm
Red	400–484 THz	620–750 nm

(Source: Donny, 2013)

Nominal Money
Paper money is a means of payment for goods and services that we often use in the world of buying and selling . Money as a tool in the transaction have been used by all people in every corner of the world , did not escape also persons with disabilities such as visual impairment , for example . Viewed from that , based on the limitations of the blind have, it is likely to be confused , one take, and also there are ignorant people who will take advantage of their weaknesses in the use of moneymentioned.

Program Arduino Ide

Figure 2. Display Program Arduino Uno (Source: Septa Ajjie, 2016)

Program code commonly called the Arduino sketch and created using the C programming language or sketch program that has been written in the Arduino IDE can be directly compiled and uploaded to the Arduino Board.
Simply put , the Arduino sketch grouped into 3 blocks (see picture above) :
Header
Setup
Loop

Header In this section are usually written important definitions that will be used later in the program , for example the use of libraries and defining variable . Code in this block is executed only once at compile time . Below is an example of code to declare variables led (integer) and also in content with the number 13 int l

Setup
Here was the beginning Arduino program run , namely at the start , or when the power on the Arduino board . Usually in this block filled determining whether a pin is used as an input or output , using the command pinMode . Initialized variables can also be done in this block // The setup routine runs once when you press the reset : void setup ( ) { // initialize the digital pin as an output . pinMode (LED , OUTPUT) ; } OUTPUT is a macro that has been defined Arduino meaning = 1. So the above command together with pinMode (led , 1) ;
A pin can be used as OUTPUT or INPUT . If the function as output , he is ready to transmit electrical current (maximum 100 mA) to load disambungkannya . If functioned as INPUT , the pin has a high impedance and ready to receive a stream sent to him .
Loop
This block will be executed continuously . If the program has reached the end of the block , then it will continue to repeat the execution of the initial block . The program will stop when the power button on the Arduino off. This is where the main function of the Arduino program we are. void loop ( ) { digitalWrite (led , HIGH) ; // turn on the LED delay (1000) ; // wait for 1000 milliseconds digitalWrite (led , LOW) ; // turn off LED delay (1000) ; // wait for 1000 milliseconds }
Digital command Write (pin Number, value) will be ordered arduino to turn on or off depending on the voltage in pinNumber value. So the above command digitalWrite (led , HIGH) will make the pin number 13 (as in the header is declared led = 13) has a voltage = 5V (HIGH) . There are only two possible values are HIGH or LOW digitalWrite which actually is an integer value of 1 or 0. If you've made the above program , then we take a USB cable that is included when purchasing the Arduino , attach it to the computer and arduino board , and upload programs. LED lights that are on Arduinoboard we will flicker . As information, an LED has been provided in the Arduino Uno board and is connected to pin 13 .

n blok *setup()* dan *loop()*the above we can define their own function blocks as needed . We 'll meet later during the discussion of the project .
(Source : Septa Ajjie , 2016)

TCS 3200

TCS3200 is a light color converter ICs to frequency values . There are two main components forming this IC , the photodiode and the converter current to frekuensi.Keluaran of the sensor itself in the form of digital output pulse shaped pulse readings RGB color .

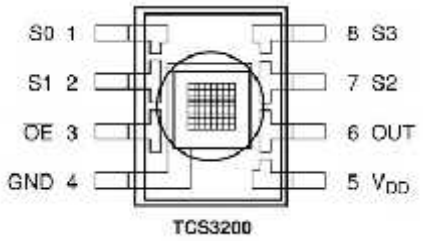


Figure3.Pin TCS 3200

(Source: Donny, 2013)

DFPlayer Mini

DFPlayer Mini is a compact and inexpensive MP3 module can be directly connected to the speakers . A module with battery power supply , speaker , keypad can be used alone , can also be controlled through a serial port , module or microcontroller Arduino Uno For the series . The module itself perfectly integrated hardware decode MP3 , WAV , WMA . While support TF card driver software supports

The function of the pins above are described in the table below:

Table3. Fungsi Pin TCS 3200

Name	No	I/O	Description
GND	4		Ground
OE	3	I	Enable for active low
OUT	6	O	Output frequency
S0, S1	1, 2	I	Output frequency scaling selection input
S2, S3	7, 8	I	Photodiode type selection input
VDD	3		Supply voltage

(Source: Donny, 2013)

Basic color frequencies simultaneously by means of filtering on each of each basic color . It required an adjustment or programming to filter taip each of these colors.

FAT16 , FAT32 file system . Can be done with simple serial commands Play music , as well as how to play music and other functions , without the underlying operating complicated , easy to use , stable and reliable .

Figure 4. DFPlayer Mini
(Source: D. Bodnar, 2015)

Table4.Information*PortDFPlayer mini*

Number	Name	Description	Note
1	VCC	Input Voltage	DC 3.2-5.0V; Typical: DC4.2
2	RX	UART serial input	
3	TX	UART serial output	
4	DAC_R	Audio output right channel	Drive earphone and amplifier
5	DAC_L	Audio output left channel	Drive earphone and amplifier
6	SPK2	Speaker	Drive speaker less than 3W
7	GND	Ground	Power Ground
8	SPK1	Speaker	Drive speaker less than 3W

9	IO1	Trigger port 1	Short pree to play previous(long press to decrease volume)
10	GND	Ground	Power Ground
11	IO2	Trigger port 2	Short pree to play next(long press to increase volume)
12	ADKEY1	AD port 1	Trigger play first segment
13	ADKEY2	AD port 2	Trigger play fifth segment
14	USB+	USB+ DP	USB Port
15	USB-	USB- DM	USB Port
16	Busy	Playing Status	Low means playing\High means no

(Source: D. Bodnar, 2015)

Spectrum Color

The spectrum of the visible part of the spectrum of electromagnetic waves rather a part of the optical spectrum of normal human eye will be able to detect the wavelengths of 400 to 700 nm, although some people may receive a wavelength of 380 to 780 nm (or in the terahertz frequency 790-400) , Eyes that have adapted to light usually has maximum sensitivity at around 555 nm, in the green region of the optical spectrum. Mixing colors such as pink or purple, are not included in this spectrum because these colors will only be obtained by mixing various wavelengths.Wavelength visible spectral range is defined by optical window, region of the electromagnetic spectrum that passes through the Earth's atmosphere almost without experiencing a reduction in the intensity or very little (though dipencarkan blue light more than red light, one reason for reaching for the sky is blue). Electromagnetic radiation outside the range of the optical wavelength, or other transmission window, almost entirely absorbed by the atmosphere. It said optical window because no man can reach areas outside the optical spectrum. Infrared located a little outside the optical window, but can not be seen by the human eye.

IV. RESULTS

Test Point Networks Overall

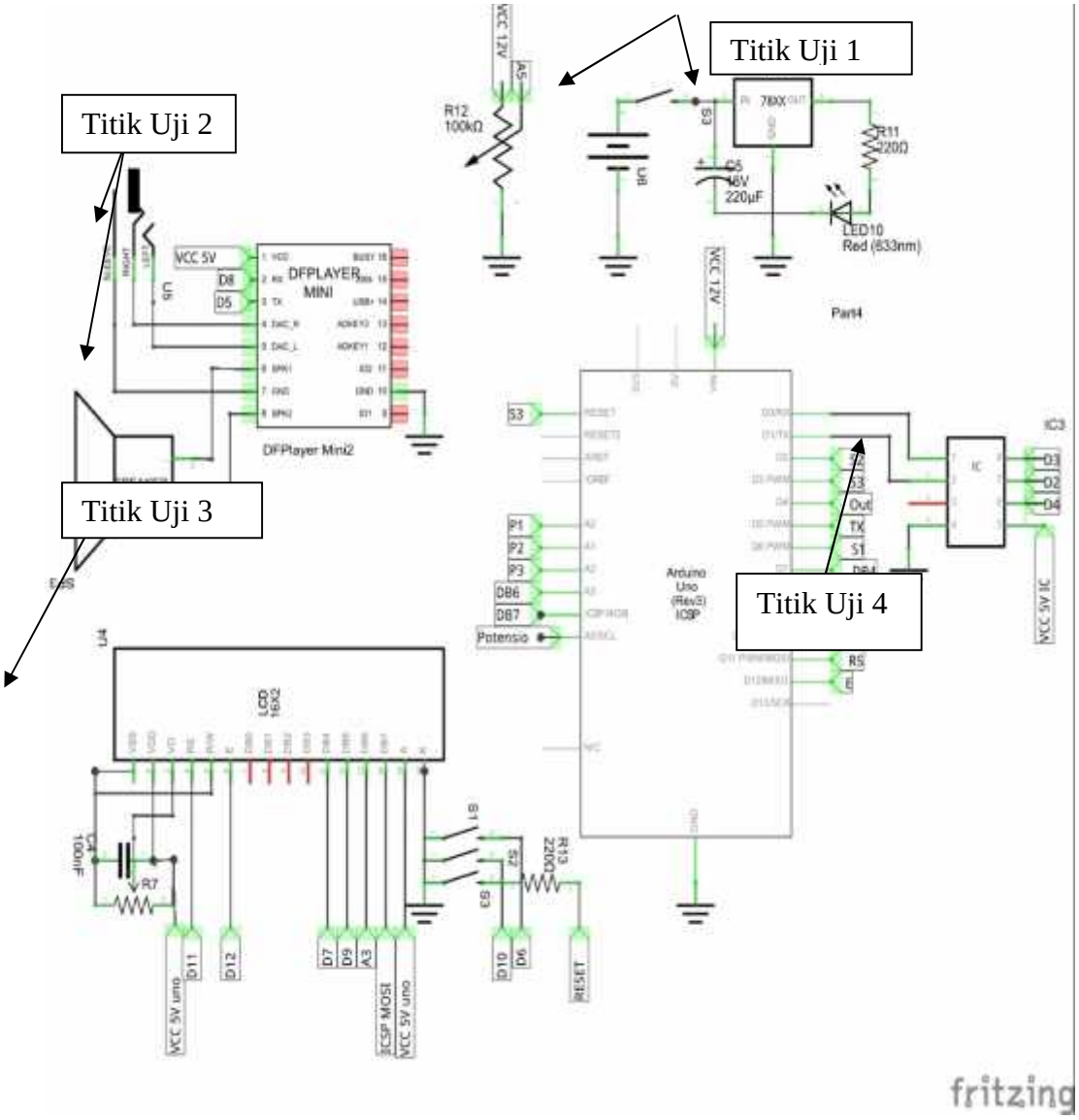


Figure5. The circuit layout Point Test Complete

4 Data Measurement Results

5 Measuring the Power Supply

The purpose of these measurements to determine the output voltage of the power supply is made in the circuit . Here is a power supply measurement data :

Table5. Power Supply Measurement Results

Test Point 1			
No.	**Voltage**	**Picture**	**Information**
1	11,63 Volt		Inputthe regulator IC 7805

2	5,02 Volt		Output the regulator IC 7805

From the measurement results obtained output power supply voltage of 5.02 V in practice , from these results, the power supply is ensured to function properly when used in arduino , DFPlayer , and sensors .

Testing Displyay LCD

This test aims to determine arduino function as the system controller . The test is aimed at the function I / O arduino and LCD as outputan to see if arduino is functioning as expected .

2x16 LCD module testing is done by connecting pin LCD with arduino digital pins on the microcontroller which already contains a software program for displaying certain posts . Testing the LCD module is intended to determine the success of the LCD display the text in accordance with a software program that is contained in the arduino .

Tabel 6. Display Test Results

LCD

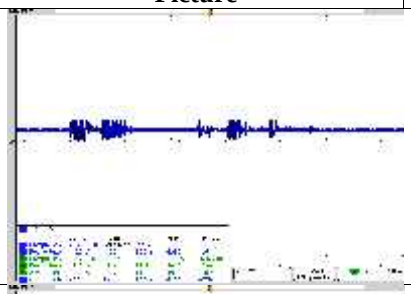
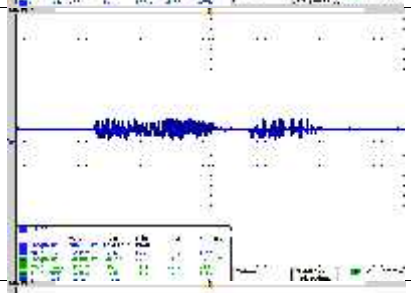
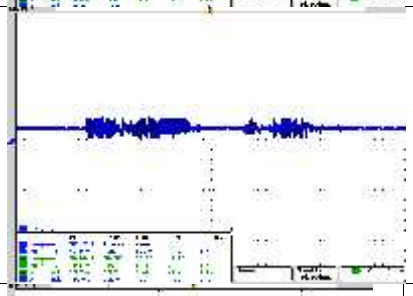
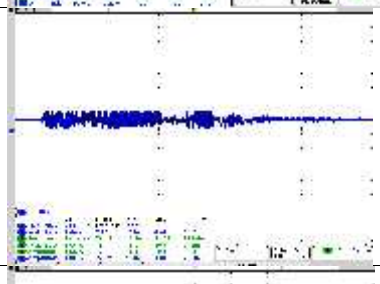
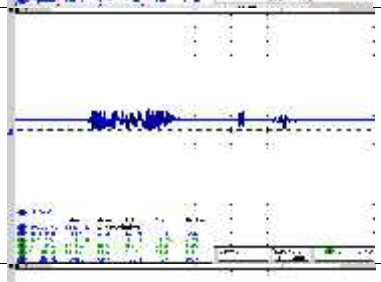
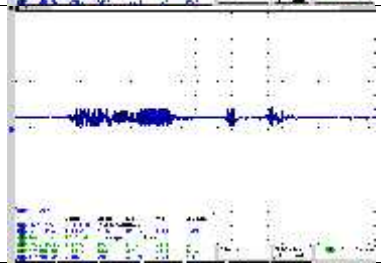
Test Point 2		
No.	**Display**	**Information**
1		Display before detecting
2		Display color detection
3		Detection Display Nominal Money
4		To see if the data is not detected

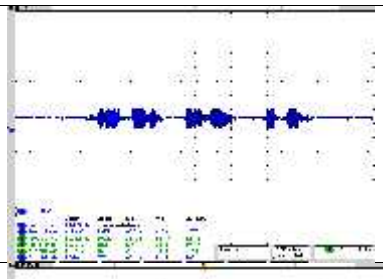
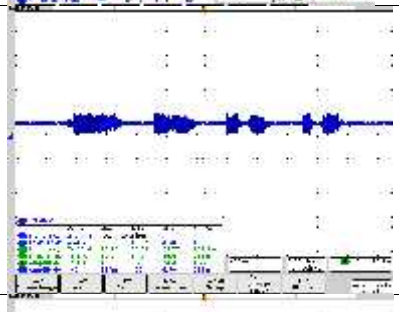
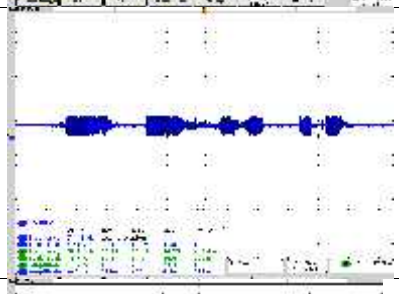
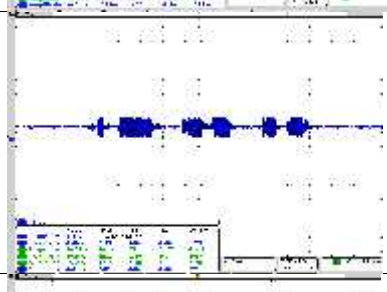
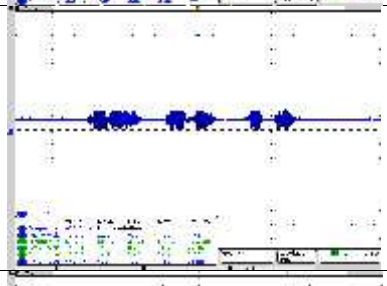
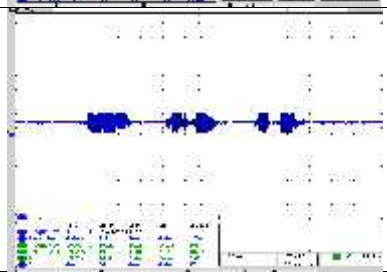
In experiment No. 1 above attempted to display the sentence on the first and second line LCD . The first line displays the word " WELCOME " and on the second line featuring " MONEY >< COLOR " .From the test results can be concluded that the series of LCD and software that has been made to work well .

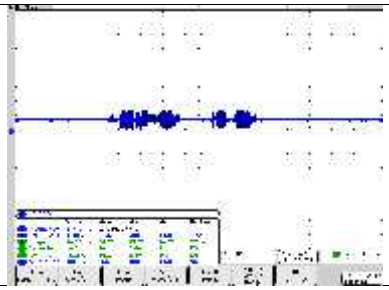
Measurement***DFPlayer Mini***

The purpose of these measurements to determine the output frequency of the sound dihasikan by dfplayer subsequently issued by the speaker . Here is a picture output .

Table7. Output Testing Results ***DFPlayer Mini***

Test Point 3			
No.	**Result**	**Picture**	**Information**
1	F=2,5 KHz Voltage = 4,2 V Amp = 400 mV T/div = 200ms V/div = 5 V		Output DFPlayer when data scan not detection
2	F=909,1 Hz Voltage= 4,4 V Amp = 400 mV T/div = 200ms V/div = 5 V		Output DFPlayer when data detectionred
3	F= 588,2 Hz Voltage= 4,4 V Amp = 400 mV T/div = 200ms V/div = 5 V		Output DFPlayer when data detectionGreen
4	F= 588,2 Hz Voltage= 4,4 V Amp = 400 mV T/div = 200ms V/div = 5 V		Output DFPlayer when data detection Blue
5	F= 833,3Hz Voltage= 4,4 V Amp = 400 mV T/div = 200ms V/div = 5 V		Output DFPlayer when data detection White
6	F= 833,3 Hz Voltage= 4,4 V Amp = 400 mV T/div = 200ms V/div = 5 V		Output DFPlayer when data detection Black

7	F= 714,3 Hz Voltage= 4,4 V Amp = 400 mV T/div = 400ms V/div = 5 V		Output DFPlayer when data detection Money Rp.100.000
8	F= 217,4 Hz Voltage= 4,4 V Amp = 400 mV T/div = 400ms V/div = 5 V		Output DFPlayer when data detection Money Rp.50.000
9	F= 714,3 Hz Voltage= 4,4 V Amp = 400 mV T/div = 400ms V/div = 5 V		Output DFPlayer when data detection Money Rp.20.000
10	F= 416,7Hz Voltage= 4,4 V Amp = 400 mV T/div = 400ms V/div = 5 V		Output DFPlayer when data detection Money Rp.10.000
11	F= 625Hz Voltage= 4,4 V Amp = 400 mV T/div = 400ms V/div = 5 V		Output DFPlayer when data detection Money Rp.5.000
12	F= 312,3Hz Voltage= 4,4 V Amp = 400 mV T/div = 400ms V/div = 5 V		Output DFPlayer when data detection Money Rp.2.000

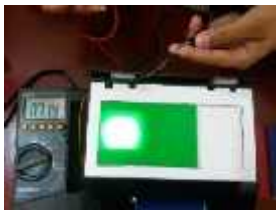
13	F= 416,7Hz Voltage= 4,4 V Amp = 400 mV T/div = 400ms V/div = 5 V		Output DFPlayer when data detection Money Rp.1.000

In the above experiment attempted to show the output of Dfplayer communicated serially on arduino uno . We can see there is a sound frequency that is displayed on the oscilloscope obtained from the measurement of output speakersebagai DFplayer.Dari test results can be concluded that the circuit Dfplayer and software that has been made to work well

The purpose of these measurements to determine the frequency of the sensor output color of the object color and banknotes in ujikan . The equipment needed in this test among others , color sensors TCS 3200 , Arduino Uno , 16x2 LCD , Speaker , DFPlayer Mini , banknotes of 1,000 , 2,000 , 5,000 , 10,000 , 20,000 , 50,000 , and 100,000 and pieces of acrylic colors red , blue , green , White and black

Measurement**Sensor TCS3200**

Table 8. Measurement Results Table **Sensor TCS3200**

Titik Uji 4					
No	**Frequency**	**Picture**	**Information**		
1	6,75 KHz		R	G	B
			50	122	87
			Red		
2	7,14 KHz		R	G	B
			94	65	81
			Green		
3	8,74 KHz		R	G	B
			136	125	64
			Blue		
4	35,51 KHz		R	G	B
			19	19	14
			White		
5	4,469 KHz		R	G	B
			152	160	109

			Black		
6	17,05 KHz		R	G	B
			31	40	30
			Money Rp. 100.000		
`7	18,88 KHz		R	G	B
			48	39	25
			Money Rp 50.000		
8	19,26 KHz		R	G	B
			38	34	26
			Money Rp 20.000		
9	15,97 KHz		R	G	B
			48	50	52
			Money Rp 10.000		
10	13,09 KHz		R	G	B
			34	42	32

<table>
<tr><td></td><td></td><td></td><td colspan="3">Money Rp 5.000</td></tr>
<tr><td rowspan="3">11</td><td rowspan="3">16,82 KHz</td><td rowspan="3">  </td><td>R</td><td>G</td><td>B</td></tr>
<tr><td>36</td><td>40</td><td>30</td></tr>
<tr><td colspan="3">Money Rp 2.000</td></tr>
<tr><td rowspan="3">12</td><td rowspan="3">6,65 KHz</td><td rowspan="3">  </td><td>R</td><td>G</td><td>B</td></tr>
<tr><td>51</td><td>51</td><td>39</td></tr>
<tr><td colspan="3">Money Rp 1.000</td></tr>
</table>

Analysis of Measurement Results

According to the datasheet, the optimal distance sensor readings with the object of banknotes which is 2.5 cm from the sensor circuit board. Area sensor readings alone has the power of view 3.5 x 3.5 mm. The sensor works sequentially starting from photodiode filter red and green photodiode filter and final filter photodiodeblue. The first process starts from red photodiode captures the reflected light that led the banknotes and colors. In the sensor module, the output of the photodiode current form and converted by the oscillator into a signal box where great frequency determined by the intensity of light captured photodiodered. A further process for green and blue filters red.Ketika Makes the same filter on the sensor readings in accordance with the data that has been entered, the tool will detect money or colors incorporated into the tool. Determination of the color and the currency identified by the value of red, green, blue or RGB generated. Each currency and colors have different RGB values, by entering the appropriate data. Then the tool can detect properly and in accordance with the color or the currency is entered into the tool.

V. CONCLUSIONS

From the result of design and testing research tool called " Color Detection Tool and Nominal Money Based Arduino UNO " it can be concluded , then generally it can be concluded that :

1. Sensor TCS 3200 - DB can be applied as a detector of nominal banknotes by forming patterns of each banknote RGB range of the sensor output in the form of frequency.
2. Effect of gradation and better the physical condition of paper money affects the frequency readout by the color sensor . The better the physical condition of the money, then the physical color of money will be more visible . As for money with gradation and poor physical condition will cause their money RGB color overlap one another so that the reading of data encountered an error.
3. RGB value obtained is inversely proportional to the frequency obtained . The lower the frequency the greater the RGB niali obtained .

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REFERENCES

[1] Ajjie, Sapta. 2016. *Buku Mudah Belajar Mikrokontroller dengan Arduino. https*: //www.academia.edu/11472322/Buku_Mudah_Belajar_Mikrokontroller_dengan_Arduino. Diakses 23 Mei 2016

[2] Bodnar. D. 2015. *Arduino MP3 Project*. http://www.trainelectronics.co m/Arduin o/MP3Sound/index.htm . Diakses 15 Mei 2016

[3] Cyber. 2015. *Merakit Sensor Warna*. https://cyber180.wordpress.com/robotika/ merakit-sensor-warna/. Diakses 23 Mei 2016.

[4] Gastomo, B. 2015. *Arduino Uno.* https://www.academia.edu/14708355/Arduino_ Uno. Diakses 15 Mei 2016.

[5] Kho, Dickson. 2015. Pengetian Baterai dan jenis jenisnya.. http://teknikelekt ronika.com/pengertian-baterai-jenis-jenis-baterai/Diaskses 15 Mei 2016

[6] Munandar, Aris. 2012. *Liquid Crystal Display (LCD) 16x2* .http://www.leselektronika.com/2012/06/liguid-crystal-display-lcd-16-x-2.ht. Diakses 15 Mei 2016.

[7] Resta, Tyan. 2010. Photodiode dan LED. *http://tyanretsa.blogsp*ot.co.id/2010/08/photodioda-dan-led.html . Diaskses 11Juli 2016

[8] Supryanto. 2015. *Pengertian Trimpot dan Fungsinya.* http://blog.unn s.ac.id/antos upri/pengertian-trimpot-dan-fungsinya/. Diakses 15 Mei 2016

[9] Sari, Mustika Ali. 2014. *Pengertian Speaker aktif dan speaker pasif.* http:/ /komputerlamongan.com/tag/pengertian-speaker-aktif-dan-speaker-pasif/. Diakses 23 Mei 2016.

Unisi, Ksatria. 2013. *RGB Scanning menggunakan TCS 3200 dan Arduino Uno.* https://ksatriaunisi.wordpress.com/2013/08/04/rgb-scanning-mengguna kan-tcs-3200-dan-arduino-uno/. Diakses 20 Juli 2016.