Motion Detection Implementation on a Game Using Raspberry Pi

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***Abstract*— Along with the development of advanced gaming technology, we can play the game with so many tools or platforms such as console games, PC games, mobile games and handheld games. The disadvantage of those games is the difficulty to connect additional sensors to the PC computer. Large power requirements will also be a constraint. Besides, the size of the PC could be a weakness that makes it difficult to carry and play anytime. Raspberry is a small computer that can be added with motion detection sensors. By using the raspberry, the researchers managed to create a game "Crows Adventure" that uses motion detection sensor as the controller. Some of the sensors used in the game are UDS Sensor (Ultrasonic Sensor distance)and touch sensors which are applied to smarthphone to control the game. This allows the use of sensors in making more varied games by using raspberry devices.**

***Keywords*— Console, Raspberry, game, sensor ultrasonic.**

I. INTRODUCTION

Along with the development of the game technology game, we can play the game with a tool or platform that assortment, such as console game, PC games, mobile games and handheld game. Console game is a separate device that is usually associated with a monitor or television to display. As mentioned in http://tvtropes.org/ [1] occurrence PS4 and Xbox One started the 8th generation of the console game. Moreover, there is a development of other game consoles, such as Nintendo, Sega. PC games requires a personal computer or laptop to play. Mobile games are games that we play on mobile phones such as Android and I-phone. Handheld game or commonly called portable game console is a type of game that is smaller in size that has a screen and can be played anytime.

There are also games that require additional sensors to play. Such as games that we have encountered in Gamefantasia or Timezone. There is a game that uses sensors shaped like a gun, and there are games like DDR (Dance Dance Revolution) as the sensors are stepped on. The weakness of the games above is difficult to connect the additional sensor to the PC computer. PC computer also has a problem because it requires large power. In addition, the size of the PC becomes a weakness that makes it difficult to use in a game that can be carried and played at anytime.

Raspberry is a small computer has advantage which is able to be added by motion detection sensors. According to www.opensource.com [2] even though small sized Raspberry is often usedfor projects that require the ability PCs and requires a detection sensor such a s robotics. Gamescreated by using python programming language and scratch can be run on Raspberry and played using LCD monitors or televisions.

II. LITERATUR REVIEW

There are a few games that use sensors to play., such as "Ultrasonic Sensor Game" [3], the game that uses two sensors UDS to play. After both players hands get closer to the sensor, the distance will be measured and the shortest distance to the sensor will win the game.Unlike " Ultrasonic Sensor Game", researchers use these sensors into a game, which the sensor will be used to control the game. Researchers are eager to examine the advantages and the disadvantages of sensor UDS compared with IR sensor that applied

in a game and what factors are likely to influence the feedback results obtained from each sensor, so that the use of a sensor in a game can be used optimally in accordance with needs.

III. RESEARCH METHODOLOGY

3.1 Design of Prototype

In this phase, the game and game consoles will be designed and manufactured using the Raspberry as the main board. In the processof designing the game, game engine is needed as well as image processing applications in order to get programming and graphics that can support the creation of a game.

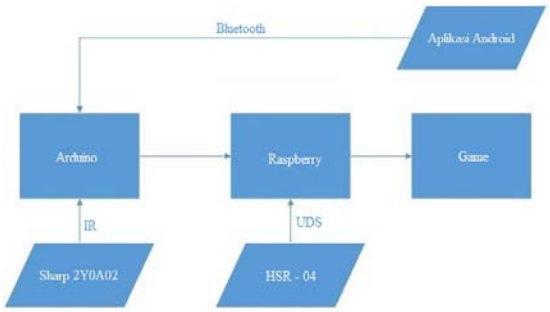

Fig.3.1Circuit of Work

Figure 3.1 is a circuit of work that creates a mini console. After the buttons on existing applications on the device is pressed, the value will be sent via Bluetooth and accepted by Arduino. In Arduino, values will be processed and be used as a controller connected via USB that is being plugged in the Raspberry.

3.2 Prototype Design of Mini Console Raspberry Pi

This prototype uses Raspberry pi 2 as the main board. Raspberry pi is used because of its ability in the process of computing like a computer but only need a small resources and have a small-sized board.

Fig 3.3Design Prototype

When the design is completed, the circuit will be paired and arranged in a box. Like in Figure 3.3, there are several components that are designed and laid into the box like Raspberry Pi 2, Arduino Leonardo Promicro, HC SR-04 UDS, IR SHARP 2Y0A02, and HC - 05 Bluetooth Module. Figure 3.4 and Figure 3.5 is the pictures of Raspberry and Arduino circuit that have been made in order to receive the distance detection sensors.

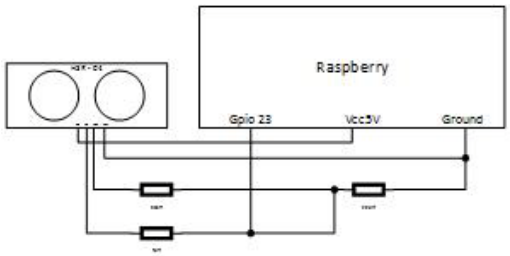

Fig 3.4Circuit of Raspberry

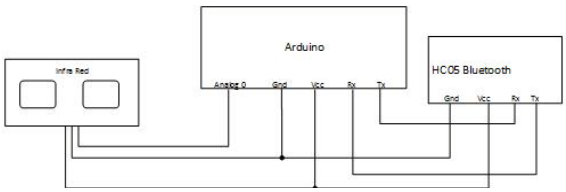

Fig 3.5Circuit of Arduino

3.3 Gameplay game "Crows Adventure"

This game uses 2-dimensional images with pixel art theme. At the beginning of the game there will be only the title game and a moving background. After a player presses the "Shoot" button, the game begins.

The game uses auto runner as the gameplay, where the crow as the main character will fly nons top and must avoid several obstacles, such as other birds.

3.4 Control Game "Crows Adventure"

The game uses the android as the media controller that will be connected via Bluetooth by using Arduino which will be processed and then will be sent to Raspberry.

The movement would use the UDS to set the height of the character, and to move right and left using the application on Android. Figure 3.7 is a sketch of the controller.

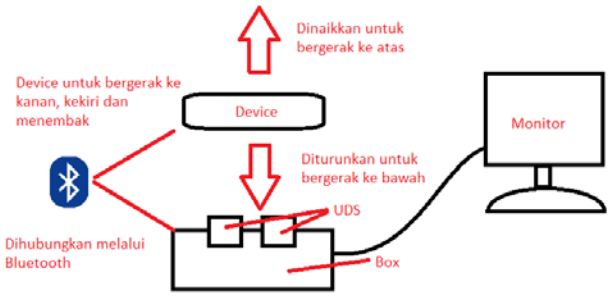

Fig 3.7Sketch of the Controller

IV. RESULTS AND DISCUSSION

4.1 Android-Based Controller

Controller of game is very important, because the player should be able to control the characters easily. This application to control the game is created by using web-based engine calledAppInventor.

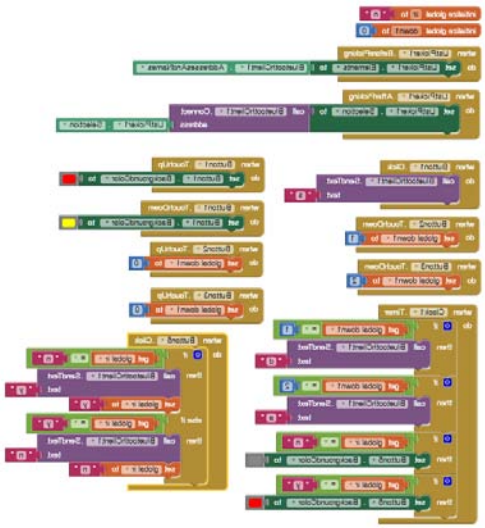

Fig 4.1*Visual Programing*Kontroler

Figure 4.1 is a visual programming of the application. At this stage, the program serves as the sender, and when the buttons that have been made arepressed as an example of " 1" that shot is pressed, then the application will send the value "s" to be captured by Arduino and will be processed in the Arduino.

4.3 Programing onthe Arduino

Code 4.1 is a program of Arduino, where the value obtained will be read and processed. Once the value has been processed, program will execute the command which will be connected to the device Raspberry as control of the game.

```
char val;
#include <Keyboard.h>;
int x = 0;
char ir = 'n';
void setup() {
      Serial.begin(9600);
      Serial1.begin(9600);
      Keyboard.begin();
}

If ( Serial1.available() ) {
      Val = Serial1.read();
      If ( val == 'y' ){
            ir = val;
      }
      else if ( val == 'n' ){
            ir = val;
      }
         Keyboard.press(val);
            }
            else {
                Keyboar.releaseAll();
            }
```

Code 4.1Code on theArduino

4.4 Programming on the Raspberry

A. Main Menu

Figure 4.2 is a view of the game "Adventure Crows". The crow is a character that can be played by a player, where the player must avoid eagle attack in order to continue the game and get the corn to increase the score.

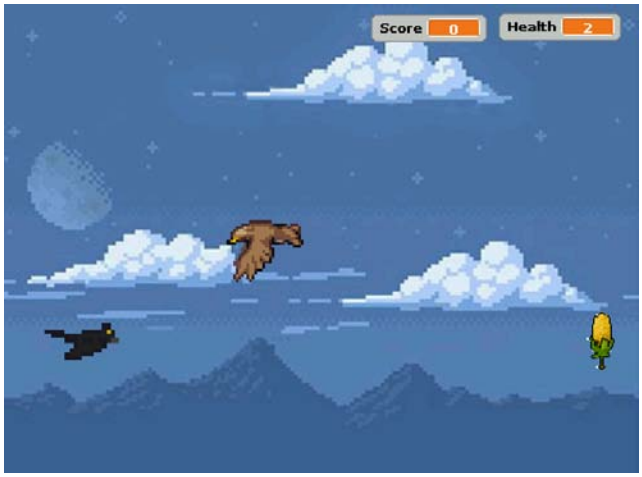

Fig 4.2Game Interface

B. Programming*of the* "Crows Adventure"

Figure 4.3 i s a pro gram i n Scratch to control t he g ame "Crows Adventure". T he values received by Raspberry will be used by the crow to move vertically.

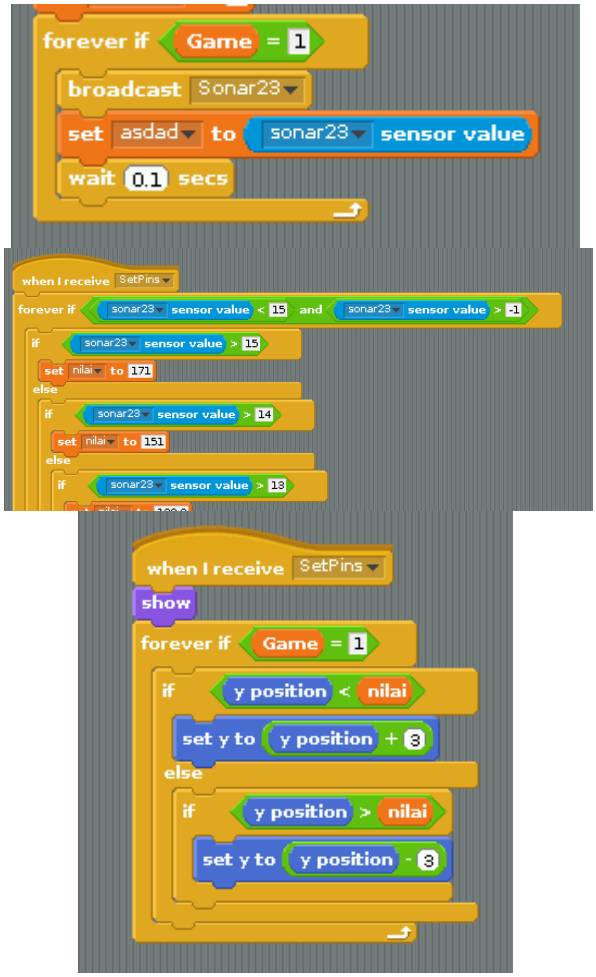

Fig 4.3Programming on the Scratch

4.5 Measurements of the UDS and IR Sensor

Because prototypes using multiple sensors such a s ul trasonic a nd infrared, t he researchers want to take measurements to see how well each of t he sensors can be used in the manufacture of a game.

By u sing t he A rduino t o m easure, researchers ca lculate the di stance from e ach sensor by seeing and observe the results that be read on s erial monitor of s ensors plugged into the pins on the Arduino.

Table 4.1 is t he r esult of t he U DS t est sensor and IR sensor to determine the sensor sensitivity i n measuring t he d istance. UDS sensors us ed in testing i s U DS se ries H SR-04, w hile t he I R s ensor us ed i s a s eries SHARP 2Y0A02.

Tabel 4.1 Distance Result

Distance Sensor to Device	Results that be read on UDS	Results that be read on IR
15 cm	16	5
14 cm	15	6
13 cm	14	7
12 cm	13	8
11 cm	12	9
10 cm	11	10
9 cm	10	9
8 cm	9	8
7 cm	8	7
6 cm	7	6
5 cm	6	5
4 cm	5	4
3 cm	4	4
2 cm	3	4
1 cm	x	x

Researchers al so test each s ensor t o determine t he pros a nd c ons of e ach s ensor. Some of t he tested things are the ability of a sensor to receive and capture value when the distance of the de vice is l ess t han 1cm t o sensors, what ha ppens i f the de vice i s t ilted and not a ligned w ith t he s ensor, how the results w ere ob tained when the f ield device is i n solid bl ack, how t he re sponse t ime of each sensor and what happens w hen getting interference l ight s ensor on t he l ocation of the g ame. Table 4.2 shows t he r esults obtained at the time of testing.

Tabel 4.2 Result of testing

The things that are tested	UDS	IR
Sensitivity in measuring distance	v	X
Distance of the device is less than 1cm	x	X
Device is tilted and not aligned with the sensor	Not Accurate	Not Accurate
The field device is in solid black	v	X
Response time	Slower then IR	Faster
Interference light sensor on t he l ocation of the game	x	V

V. CONCLUSIONS

The conclusion of t his r esearch ar e as follows:

1. Game " Crows A dventure" uses sensors i n the de vice as a con troller Raspberry. S ome of t he s ensors us ed in the g ame ar e U DS s ensors, IR sensors a nd t ouch s ensors. T he sensors can be added to the device by plugging pi n Ra spberry e xisting on the s ensor i nto t he G PIO pi n contained in the raspberry.
2. Game " Crows A dventure" is designed using Scratch. To play t he game, i t requires app lication on Android de vices m ade by s oftware AppInventor t o m ove l eft, ri ght a nd shoot. While t he di stance de tection sensor is used to set up a nd do wn on the characters in the game.
3. The s ensors t ested are U DS s ensor and I R s ensor. UDS sensors u se sound a s a m edium, w hile t he I R sensor us es i nfrared l ight a s a medium. A fter re searchers conduct a study t o determine t he f actors t hat influence t hese s ensors i n a g ame, researchers g et t he r esult t hat ea ch sensor ha s i ts adv antages and disadvantages. UDS s ensor i s m ore sensitive t o distance t han the I R sensor, but to the response time of IR sensors is faster. It is because the IR sensor uses light as a m edium. Other factors affecting t hese s ensors i n a game are the color of the back side of the us ed device. If t he ba ck side of the device has a solid black color, IR sensor has difficulty in measuring the distance, es pecially w ith the l ight around will also affect the d istance measurements pe rformed b y IR sensor.

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