Project Documentation

Project title: A game of Sprite

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AIM:

To create a simple 1-button video game made from a handful of parts in the Arduino Basic Kit from 123D Circuits. It is a side-scrolling jumping game. This serves as a good starting point for creating your own games from simple maker electronics.

Motivation: We were having a look at previous year projects done under the electronics club, we saw many game controllers. So we thought of a game controller that can work for all the latest games, is full featured, and gaming looks more realistic using that. Inspired by things like Microsoft © Kinect™, Sony© Play Station™ motion controller, and many more such controllers available in the market, we came up with this idea.

PARTS

1 x Arduino UNO

1 x LCD screen (16 x 2 character)

1 x Electronics breadboard

1 x 220 Ω resistor

1 x Pushbutton switch

Solid-core hookup wire

1 x USB cable

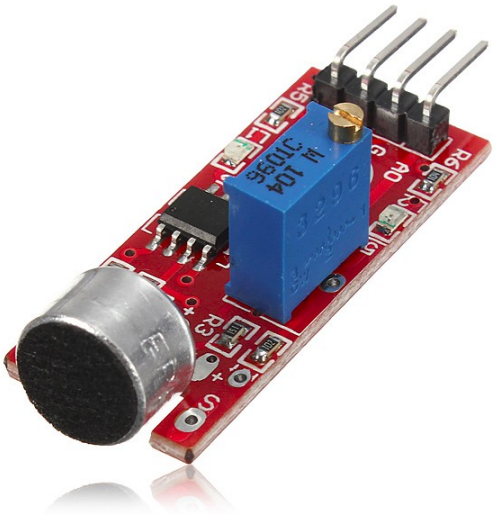
THEORY:

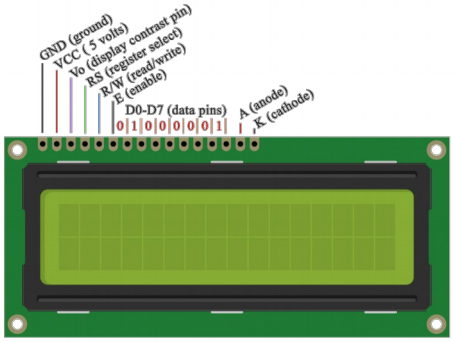
microphone sensor:

The Microphone, also called a “mic”, is a sound transducer that can be classed as a “sound sensor”. This is because it produces an electrical analogue output signal which is proportional to the “acoustic” sound wave acting upon its flexible diaphragm. This signal is an “electrical image” representing the characteristics of the acoustic waveform. Generally, the output signal from a microphone is an analogue signal either in the form of a voltage or current which is proportional to the actual sound wave.

The most common types of microphones available as sound transducers are Dynamic, Electret Condenser, Ribbon and the newer Piezo-electric Crystal types. Typical applications for microphones as a sound

transducer include audio recording, reproduction, broadcasting as well as telephones, television, digital computer recording and body scanners, where ultrasound is used in medical applications. An example of a simple “Dynamic” microphone is shown below.





LCD screen:

A liquid crystal display or LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. Liquid crystal displays are super-thin technology display screen that are generally used in laptop computer screen. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology.

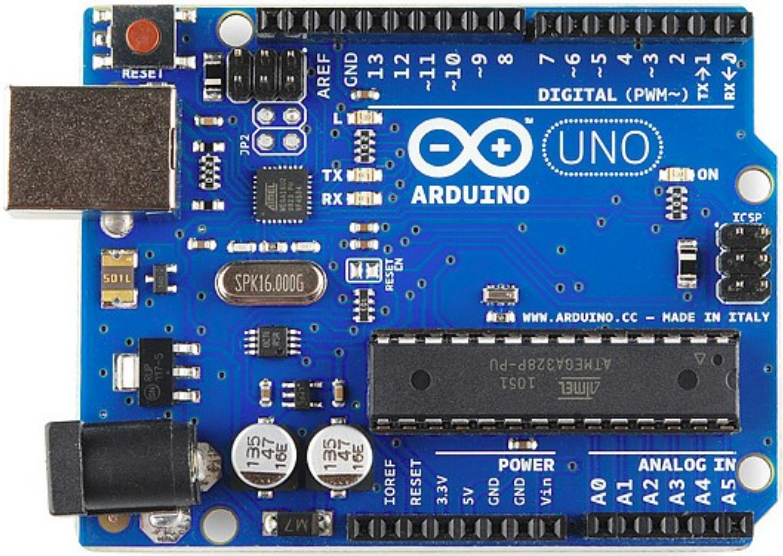
Liquid crystal display is composed of several layers which include two polarized panel filters and electrodes. Light is projected from a lens on a layer of liquid crystal. This combination of colored light with the grayscale image of the crystal (formed as electric current flows through the crystal) forms the colored image.

Microcontroller:

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. The one we used is **Arduino Uno.**

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.



Communication

We have used Serial communication (also known as UART) to send data from arduino to the computer through USB serial COM ports.

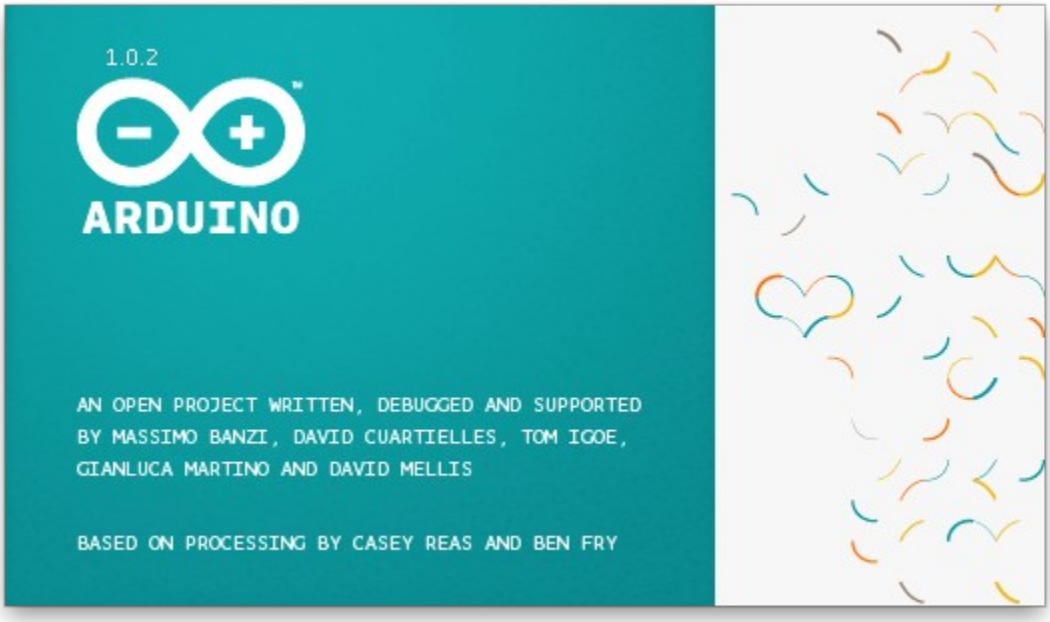
UART: A Universal Asynchronous Receiver/Transmitter, abbreviated UART, is a piece of computer hardware that translates data between parallel and serial forms. UARTs are commonly used in conjunction with communication standards such as EIA, RS-232, RS-422 or RS-485. We used UART to transfer our data from arduino to the computer through serial COM ports for further processing.

Programming Platforms:

For programming the arduino, we have used the default arduino IDE.

The code running on the computer which receives the data from serial port, and decodes it to perform various functions is written in C.

The C compiler used is DEV C++.



Implementation:

All the components are giving readings to the arduino, where we are converting these readings into character code in order to send the bytes efficiently and quickly to the computer. Inside a never ending loop, every reading corresponds to a character. So a package is created every time the loop runs, and that is sent to the computer. This package contains the data coming from each and every sensor, and finally this needs to be decoded on the computer to get the readings.

A code should run on the computer in order to receive the data that is being sent by arduino via serial ports. This code is written in C language. The function com->connect() initializes the serial communication between the computer and arduino. We have written a

library in which we have defined this function. The connection is refreshed on starting of the loop so that the values do not get mixed up.

The character code is decoded according to algorithm, and now the data is used to control mouse and the keyboard. The functions to move mouse and pressing the keys of the keyboard defined in windows library, windows.h.

But this movement won't work inside games as games take data directly from the hardware, not from the windows.

PROCEDURE:

1. Using short hookup wires, connect GND and LED- (pins 1 and 16) to the black row at the top.

Similarly, connect VCC (pin 2) to the red row at the top with a short hookup wire.

2. Bend the wire leads of the 220 Ω resistor (red-red-brown colored bands) and connect it between LED+ and the red row at the top of the breadboard.

3. Use longer hookup wires to make the remainder of the connections:

- Connect DB7 to Arduino pin 3
- Connect DB6 to Arduino pin 4
- Connect DB5 to Arduino pin 5
- Connect DB4 to Arduino pin 6
- Connect E to Arduino pin 9

- Connect R/W to Arduino pin 10 (or to black row at top of breadboard)
- Connect RS to Arduino pin 11
- Connect V0 to Arduino pin 12 (or to black row at top of breadboard)

4. Plug the pushbutton somewhere to the left of the LCD screen, straddling the channel running along the center of the breadboard (see picture above). Connect one of the top two pins of the button to the black row at the top of the breadboard using a short hookup wire. Connect the other pin at the top of the button to pin 2 of the Arduino.

5. At this point, you should be ready to program the Arduino and test it out.

6. Start by making sure that you have the Arduino software installed on your computer.

Download the LCD_Game.ino file on this page to your computer and open it in the Arduino software. Make sure the board is set properly for programming (Tools → Board →Arduino Uno).

7. Connect the Arduino to your computer using the USB cable. This will provide power to the Arduino/game and allow you to upload your program to the Arduino.

8. At this point, the screen of the LCD display should light up.

9. Program the Arduino by selecting File → Upload (or press the right arrow button at the top of the Arduino software). If all goes well, the LCD screen should now show the game start screen.

Final Working

1. Clapping or any sound shall trigger the sprite man to jump. Anything louder than the threshold value of the microphone shall be enough for a jump.

2. The aim of the game is to jump over obstacles and have the longest run.

3. The game can be triggered by a button as well.

4. User needs to avoid obstacles on top and bottom.

5. Difficulty level can be set by adjusting speed and frequency of obstacles.

UTILITY

1. Physical Activity

There are lots of video games in the market that the operation requires some kind of physical activity. Whether it's dancing or playing guitar. This is where the ingenuity required parents to have the kind of games for their children, which can force them (the children) to move rather than have to sit on the couch all day.

2. Fitness and Nutrition

Many game that combines elements of fitness, nutrition and healthy living as the primary goal game. Even some games that present the main goal of their game on physical fitness which aims to encourage the players to lose weight to maintain a healthy lifestyle.

3. Eye and hand coordination

Playing video games can actually improve your child's dexterity, which is very useful to perform daily activities. Actually, many types of exercise that can be done to improve the coordination between hand and eye, but it is less attractive children's desire to try it.

4. Social Skills

Lack of social skills and ability to interact with others on a regular basis can damage a child's development and even cause depression. Children who are shy and lack confidence when socializing with their friends may find it easier to open up when playing video games.

5. Increased Learning Ability

Complexity games give your child the opportunity to improve cognitive skills such as solving problems and making decisions. Video games have grown to the point where users have to take control and think for

themselves. Even a lot of games that encourage children to be patient and kreativ in solving a puzzle before they can progress to the next stage.

6. Sportsmanship and Fair

Sportsmanship and fair (fair play) are common values developed in the sport and organization. Games are not directly offer your child these values, especially when competing with each other.

7. Reduce Stress

Stress is not only experienced by the parents but also the children. Some parents sometimes put the actual expectations and demands of their children do not like, for example related to hobbies and learning. Playing games can be a way out for your child escape from the pressures to reduce stress levels.

8. Teamwork

Cooperation and the need to build a strong team work

influence when children play video games. Some online games for example, which requires a team effort to achieve victory.

9. Overcoming Pain

Playing video games can be a means to cope with physical or emotional pain, for example, in people who are suffering from a disease which can only perform activities in the bedroom.

10. Make People Happy

One of the biggest effects of playing games is to make people happy. However, it is important to limit the time playing games, because there is possibility that this tool makes you become addicted. Allow your children to play games as often as possible, but do not forget to remind them to stop. Also make sure your child is still doing the activity in the social environment.

Useful links

http://www.instructables.com/id/Arduino-LCD-Game/step3/Changing-things-and-making-an-Arduino-game-shield/

http://students.iitk.ac.in/eclub/assets/documentations/summer13/E_glove.pdf

https://www.arduino.cc/

Thank **you.**