

**Peek-a-BOO Kit | JAMECO PART NO. 2260076/2260084/2260092**



**Experience Level: Beginner | Time Required: 1+ hour**

Make a ghost that reacts to an approaching object in the room. When idle, the ghost will keep its eyes covered, and when someone walks past, it will quickly uncover its eyes. The main body and arms of the ghost can be made out of cardboard or poster board. You'll want something sturdy, but not too thick that the servo can't attach to the arms. More cardboard can be used to create a support to keep the ghost propped up. The downloadable sample code starts the reaction distance at three feet away. You can adjust the distance, delay time and variables used for each servo to change the swing of the arms to change the behavior of the ghost.

**Required tools and parts:**

- Cardboard or poster board
- White paper for the ghostly image
- Tape or hot glue
- Computer with latest Arduino IDE
- Ultrasonic library (download)  
<http://www.jameco.com/Jameco/Products/ProdSW/2206168AdditionalFiles.zip>
- Ghost sample code (download)  
<http://www.jameco.com/Jameco/Products/ProdSW/2260076SampleCode.zip>

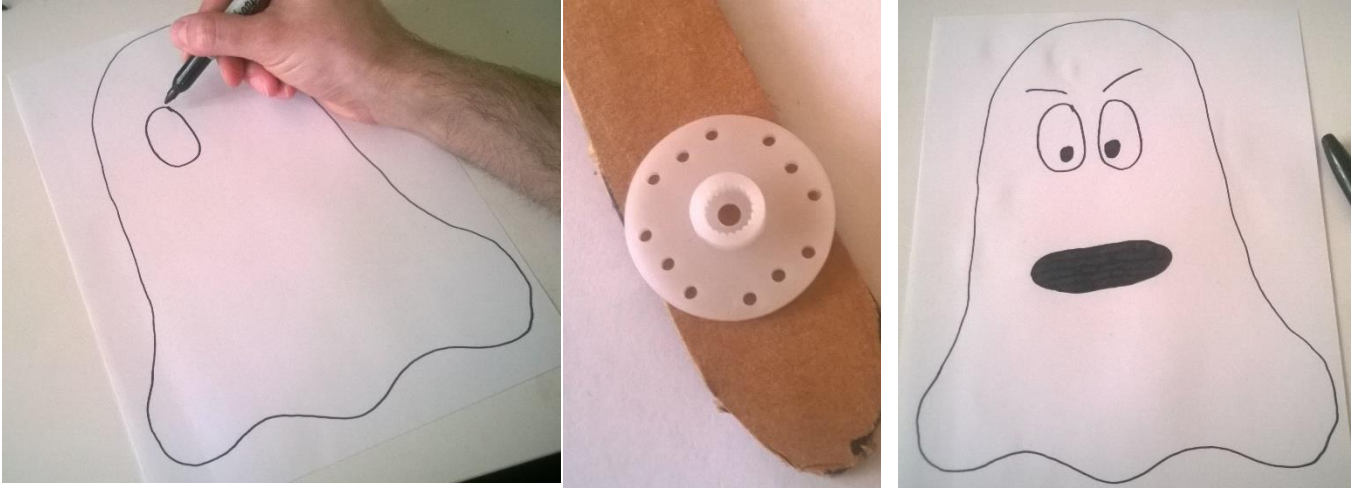
**Kit Includes**

- (1) Arduino Uno\*
- (1) breadboard
- (2) micro servos
- (1) sensor
- Connecting wires\*

\*May not be included in all kits depending on kit version. Instructions are the same regardless.

### Step 1

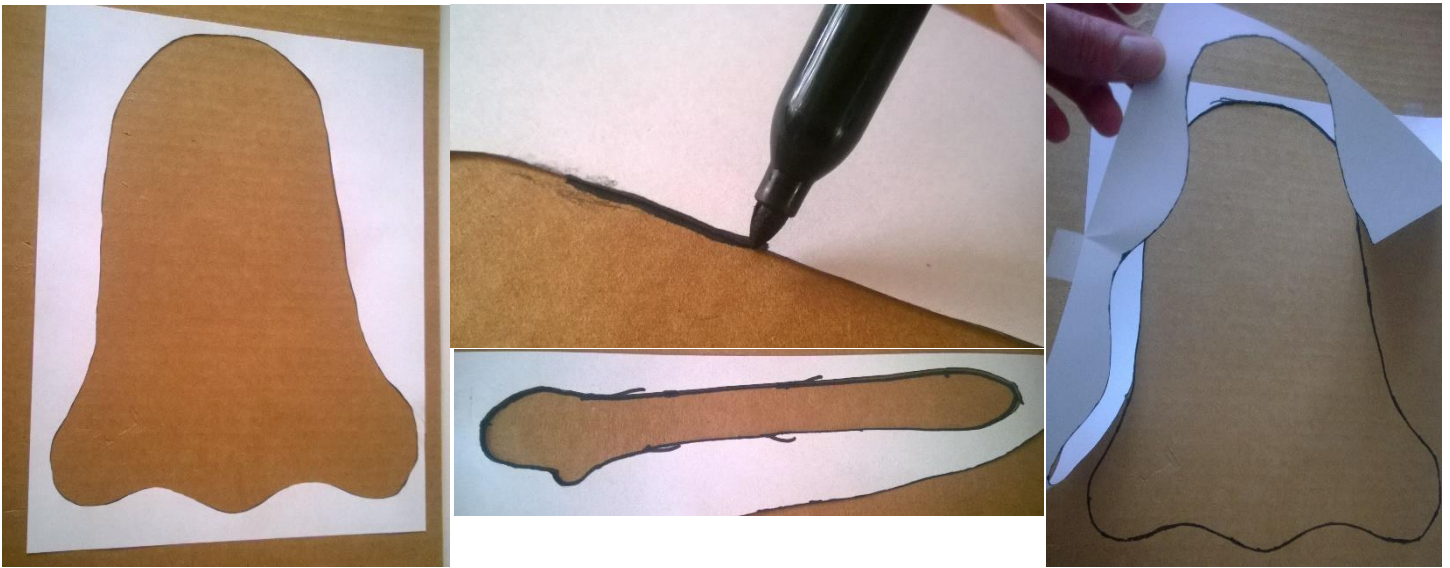
Draw your ghost on a piece of paper. You can also draw some arms when you know how long they should be. Make sure the arms are wide enough to cover the round servo attachment. Cut out the ghost and arms and save



the scrap pieces.

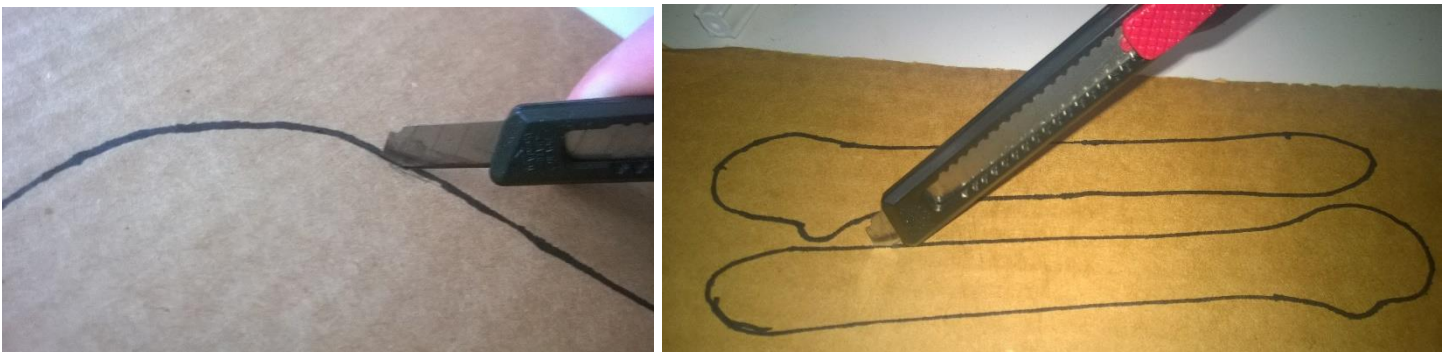
### Step 2

Trace the ghost and arm shapes onto a piece of cardboard using the scrap left over from cutting out the ghost.



### Step 3

Cut out the ghost and arms from the cardboard with a hobby knife.





#### Step 4

Use hot glue and attach the round servo attachment close to the end of the arm.



#### Step 5

Cut the arm holes where the servo shafts will connect from the back side.



#### Step 6

Trace the ultrasonic sensor on the backside of the paper ghost, and cut out the circles with a hobby knife. Place the paper ghost over the cardboard ghost and trace the sensor circle cutouts. Carefully cut out the circles.



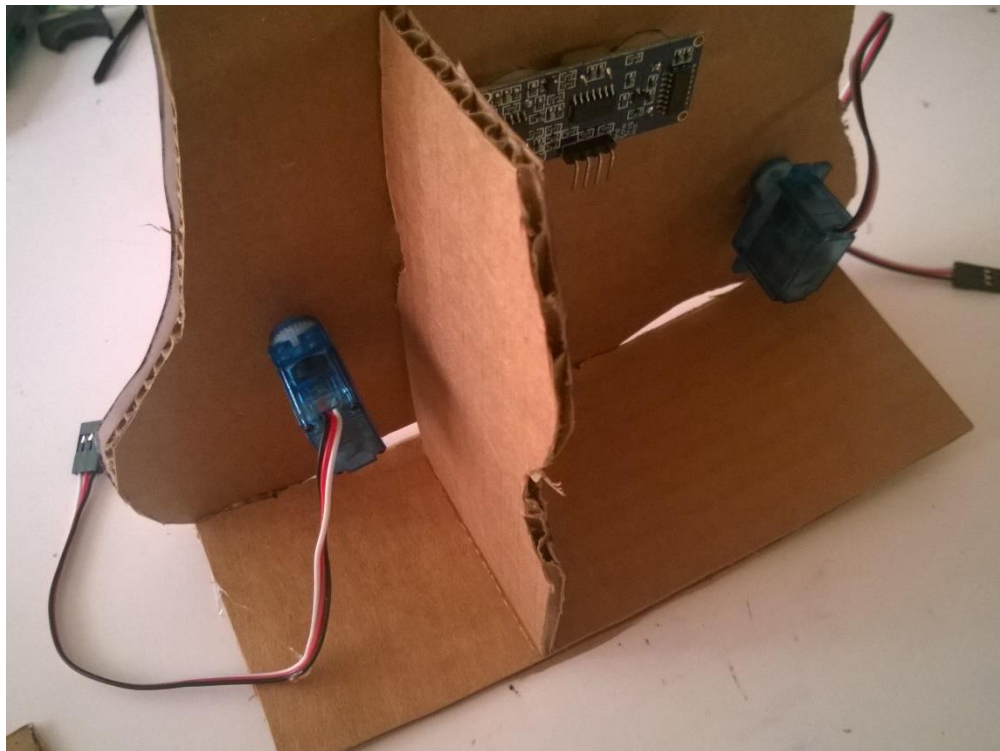
### Step 7

Use a little hot glue to attach the paper ghost to the cardboard. You can temporarily mount the sensor to help hold everything in place. Glue a little at a time and work from one side to the other. Do the same for the arms.



### Step 8

Use some cardboard scraps as a base and upright support for the ghost. Use hot glue to attach the pieces.



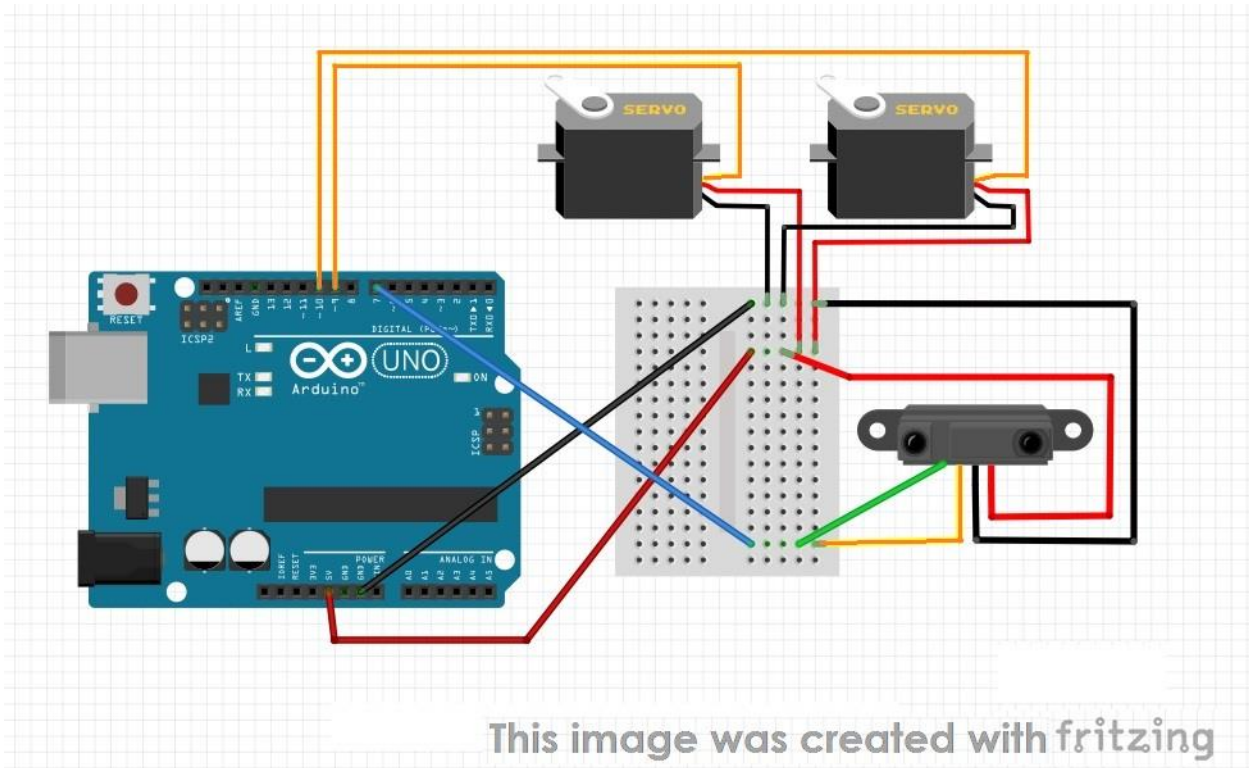
### Step 9

Use hot glue to attach the servos to the back of the cardboard ghost so both have the same vertical orientation. Be careful not to get any glue on the shaft. Hold them in place until the glue dries. Wait to attach the arms until after you've centered the servos.



### Step 10

Make the connections:



- Connect a wire from the black wire on one of the servos (ground) to your breadboard.
- Connect a wire from the black wire on the other servo to the same row on the breadboard as the other black wire. (Both servo black wires on the same row).
- Connect a wire from the red wire of one servo (power) into a new row on your breadboard.
- Connect a wire from the red wire on the other servo to the same row on the breadboard as the other red wire. (Both servo red wires on the same row).
- Connect a wire from the white (or yellow) wire on the ghost's right arm servo (signal) to pin 9 on the Arduino Uno
- Connect a wire from the white (or yellow) wire on the ghost's left arm servo to pin 10 on the Arduino Uno.



- Connect a jumper wire from the GND pin on the ultrasonic sensor to the ground row on the breadboard. It should also share the connections with the black wires of both servos.
- Connect a wire from the row of ground (black) connections on the breadboard to the GND pin on the Arduino Uno.
- Connect a jumper wire from the VCC pin on the ultrasonic sensor to the power row on the breadboard. It should also share the connections with the red wires of both servos.
- Connect a wire from the row of power (red) connections on the breadboard to the 5V pin on the Arduino Uno.
- Connect a jumper wire from the TRIG pin on the ultrasonic sensor to a new row on the breadboard.
- Connect a jumper wire from the ECHO pin on the ultrasonic sensor to the same row as the TRIG pin on the breadboard.
- Connect a wire from the TRIG/ECHO row on the breadboard to pin 7 on the Arduino Uno.
- Mount the servo in the mouth of the ghost. Use a Sharpie to black out the silver color of the sensor.
- Connect a wire from the row of power connections (red) to the 5V pin on the Arduino Uno.
- Connect a wire from the row of ground connections (black) to the GND pin on the Arduino Uno.

### Step 11

Upload the code. Make sure you have the Ultrasonic\_Ranger library installed first. You need to center the servos at their midpoint before you can attach the arms. Open the Ghost code and delete everything in the main loop so the Arduino will only initialize the servos and center them at 90. Your main loop should just say: `void loop() {`

```
#include <Servo.h>

/* The servos are both positioned in the same orientation. 90 is
the midpoint. The right arm servo should use values from 90 to
0, and the left arm servo should use values from 90 to 180.*/

Servo rArm; // create a servo object for the right arm
Servo lArm; // create a servo object for the left arm

void setup()
{
  rArm.attach(9); // attach the servo to pin 9 in the servo object
  lArm.attach(10); // attach the servo to pin 10 in the servo object
  rArm.write(90); // set the servo to the midpoint
  lArm.write(90); // set the servo to the midpoint
}

void loop()
{
}
```

Attach the arms so they are covering the eyes when at the centered position. Reload the Ghost loop with the main loop intact which will incorporate the ultrasonic sensor. By default, 36" is the trigger point for the ghost to react. You can change the reaction distance, delay time before responding again, and the amount of arm movement. The right arm should use values from 90 to 0, and the left arm should use values from 90 to 180.

```

#include <Servo.h>
#include "Ultrasonic.h"

/* The servos are both positioned in the same orientation. 90 is the
midpoint. The right arm servo should use values from 90 to 0, and the left
arm servo should use values from 90 to 180.*/

Servo rArm; // create a servo object for the right arm
Servo lArm; // create a servo object for the left arm
Ultrasonic sensor(7); // create the object for the sensor

void setup()
{
  rArm.attach(9); // attach the servo to pin 9 in the servo object
  lArm.attach(10); // attach the servo to pin 10 in the servo object
  rArm.write(90); // set the servo to the midpoint
  lArm.write(90); // set the servo to the midpoint
}

void loop()
{
  sensor.Measure(); //send a ping and listen for echo
  if (sensor.RangeInInches > 36) //change number for distance reaction
  {
    lArm.write(90); //eyes covered
    rArm.write(90); //eyes covered
    delay(500);
  }
  else {
    lArm.write(120); //eyes uncovered
    rArm.write(60); //eyes uncovered
    delay(2000);
  }
}

```