

WAKE UP

Discus Edition

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What is the WAKE UP: Discus Edition?

The WAKE UP: Discus Edition is an alarm clock, holding a phone inside, that is set off by a phone's alarm which then shoots out a discus to hit the user to wake her up. To retrieve her phone, she would have to get out of bed to take it out of the box. We came about this

idea after interviewing Emma, an undergraduate student at UC Berkeley that is also a discus thrower for Cal. One of her main pain points was her struggle to get out of bed in the morning because she stays in bed browsing on her phone.

Interview Process

We started out interviewing four people. We settled on designing for Emma because we found her passion for discus particularly unique. When Pamela first interviewed Emma, we learned that she balances a hectic schedule of being an athlete for Cal and a full-time student. She was overall very positive and the only problems she seemed to have were her back injury and her pet peeve of her friends on their phones when they are hanging out. Her back injury wasn't something we could fix so we decided to focus on her pet peeve. In our second interview, we identified another pain point related to her phone : staying in her bed

too long due to browsing on her phone. Another pain point we identified was that despite her love of photography, she's always behind the camera so she doesn't have many pictures of herself. There are already existing products that could easily solve her last pain point as well as her pet peeve from the first interview (for example, therapy for her back, and remote timer for a camera). As a result, we decided to tackle her problem of staying in bed for too long in the morning due to browsing on her phone. We found this pain point interesting in that as an athlete with such a busy schedule, she seemed very put together and organized,

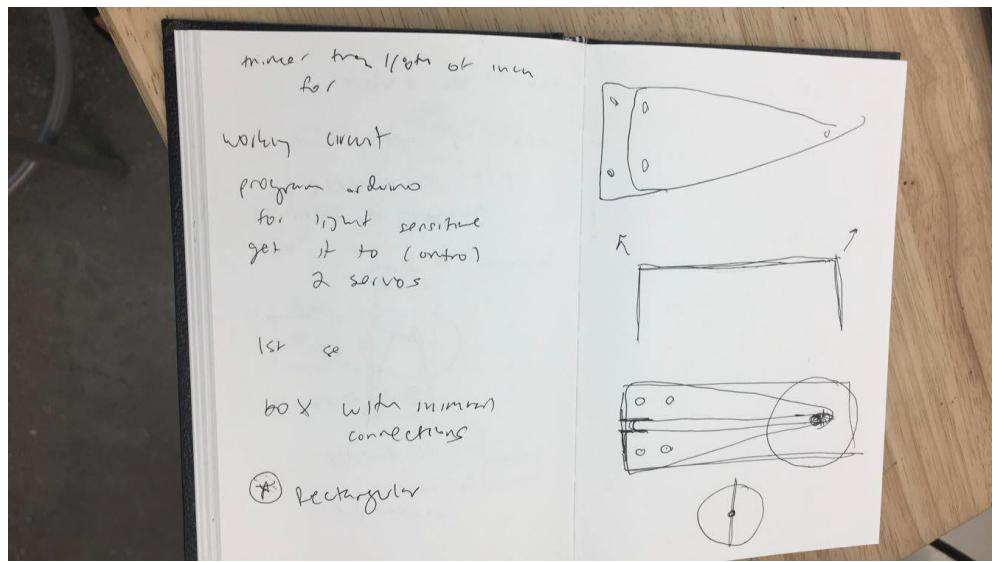
Tools used in this project:

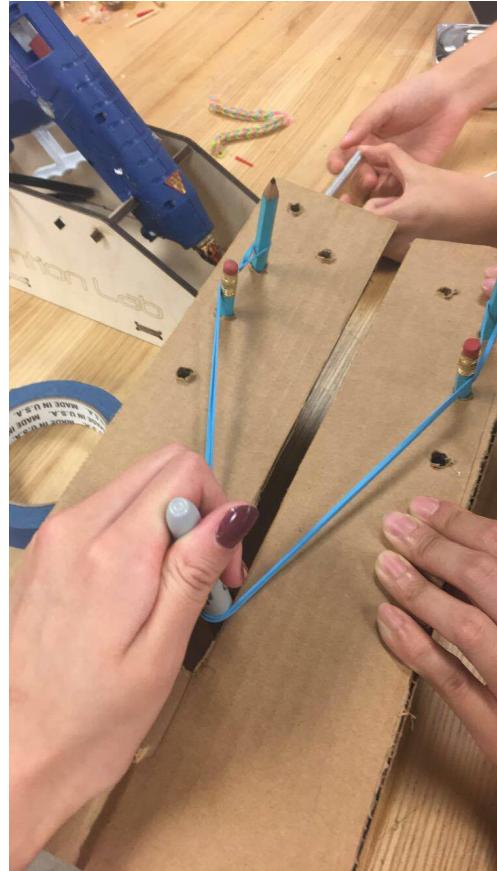
- 2 1/8 inch plywood panels
- Arduino
- Servo
- Sound sensor
- ProtoShield
- Resistor
- Piece of plastic
- Black net
- 5x5 in. sheet of red vinyl cloth
- Found 3D printed plastic stands
- 9 Dowels
- Green spray paint
- Metallic silver spray paint
- Wood Glue
- Painter's Tape
- Hot glue gun

Brainstorming and Sketching

To tackle the pain point we decided on, we wanted to use her passion for discus to inform our design. We did a bit of research on slingshots /frisbee throwers and developed a design that combined the idea of phone holder, alarm, and some form of slingshot. Initially, our idea was an alarm that hits her with a discus, and in order to turn the alarm off and retrieve her phone, she has to place the discus back in the alarm, which would unlock the box. After much discussion, we knew that the electronics to accomplish all of this might be too complicated, so we decided to focus on the discus shooter only, and not the unlocking mechanism.

After much help from Chris from the Citrus Invention Lab, we sketched out the design for a box, holding her phone, with a trigger that is activated by the light of her phone's alarm. Once the alarm goes off, the light of her phone triggers a discus to hit Emma and wake her up. To retrieve her phone, she would have to get out of bed to take it out of the box.





Initial Prototyping

Based on our sketches, we started with a cardboard prototype to test various factors such as the distance between the dowells that would hold the rubber bands, the tightness of rubber bands, and various possible materials to create a flexible latch. We ended up using two skinnier rubber bands and four dowells approximately two inches apart from each other to hold up the rubber bands. For the latch, we found a piece of plastic that worked great. To mimic the flexibility of the plastic, we found a

laser-cut pattern that would allow plywood to be somewhat bendable.

In terms of the electronics, we programmed the Arduino to move the Servo, with an arm attached to it, to be able to move the latch just enough to release the sling. More detailed testing was needed on the final prototype because the materials were slightly different since we lasercutting wood for the final latch.

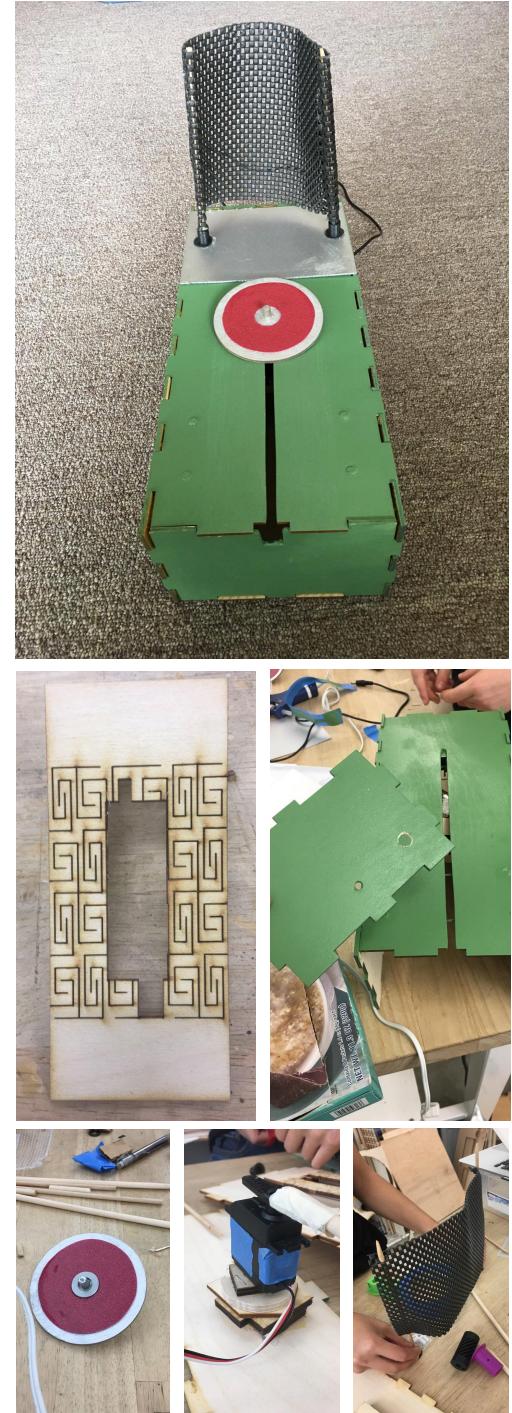
Final Prototype

Once the cardboard prototype was complete, we began laser-cutting and building the final prototype. Putting together the box was pretty straightforward,. We spent the most time adjusting the angle and strength of the Servo to open the latch just right and adjusting the Arduino so it reacts to the phone's brightness correctly. This was especially challenging because the light sensor was very sensitive to light so even the smallest change in environment affected it. To solve this issue, we originally felt it would be best to change to a sound sensor. We tried this out, and we realized that Emma would no longer need to keep her phone in the box, since the sound of an iPhone alarm could trigger the discus from any part of her room, which would be counterproductive. We decided to go back to the light sensor, and we were able to stabilize the light sensor so that it would not need to be changed constantly in different lighting conditions. We felt this was more appropriate for Emma, since she would need to put her phone in the box so that it could be activated by the minimal light of her phone alarm. Aside

from this, in our prototyping, we struggled with how to make the alarm user friendly, so that she could pull the discuss back herself, instead of reaching her hand in and pulling from beneath. To solve this issue, we created a ramp like piece within the box, so that, she could pull the discuss back and it would be guided by the ramp and lock into place with no extra work.

In terms of tying in her interests related to discus, we designed the projectile object to resemble a discus using spray paint and vinyl cloth. We also spray painted the box green to represent the field and built up a net and spray painted a square piece of plastic metallic sliver to mimic the layout in discus throwing.

Though we understand that this type of design may be quite forceful as an alarm tool, we felt it was appropriate for Emma's needs. After we showed her the final prototype, she laughed and agreed that she needed a more aggressive tool to wake her up, and she appreciated the discus theme.



Step by Step Making

The Box and Electronics

1. Laser-cut outer box, discus circle, and latch components from AI file provided.
2. Sand all outer sides of the box.
3. Spray paint all sides of the box green.
4. To make the action of inserting the discus user friendly, cut out 2 pieces of 1/4 inch plywood at 1 inch by 2 inches. Glue together and cut them in half at a 45 degree angle. Insert this piece on the bottom of the latch, so that it faces the discus' dowel.
5. Glue latch together.
6. Glue latch in line with end of the gap on the top panel of the box.
7. Break four dowels into one inch pieces and insert into top panel of box.
8. Put two rubber bands onto the four dowels.
Make sure to push them all the way up against the top panel of the box.
9. Wrap and tie one rubber band around each side of the latch and closest dowel.
10. Program Arduino.
11. Follow the Circuit diagram and connect all parts.
12. Tape extra dowel onto Servo arm so it is long enough to reach the latch when attached to the right panel.
13. Stack pieces of scrap wood as needed onto the

right panel. Test and position until it can sufficiently support the Servo to reach the latch.

14. Glue Servo onto the stacked pieces of wood.
15. Glue the box's side panels onto the top panel.
16. Tape other electronics to a fitting position on the top panel.
17. Glue together all the other sides of the box.

Discus

18. Insert and glue dowel piece that's about one inch long into hole of discus circle.
19. Sand surface of discus
20. Spray paint discus metallic silver
21. Cut and glue red vinyl into inner circle of the top part of the discus.

Discus Aesthetics

22. Spray paint plastic rectangle metallic silver.
23. Cut two pieces of the dowel to match the net's height.
24. Thread dowel into net.
25. Glue dowel ends into the plastic stands.
26. Glue plastic rectangle onto the end of the top panels opening. (On the outside of box)
27. Glue net to make a half circle around the plastic rectangle.

Code

```
#include <Servo.h>

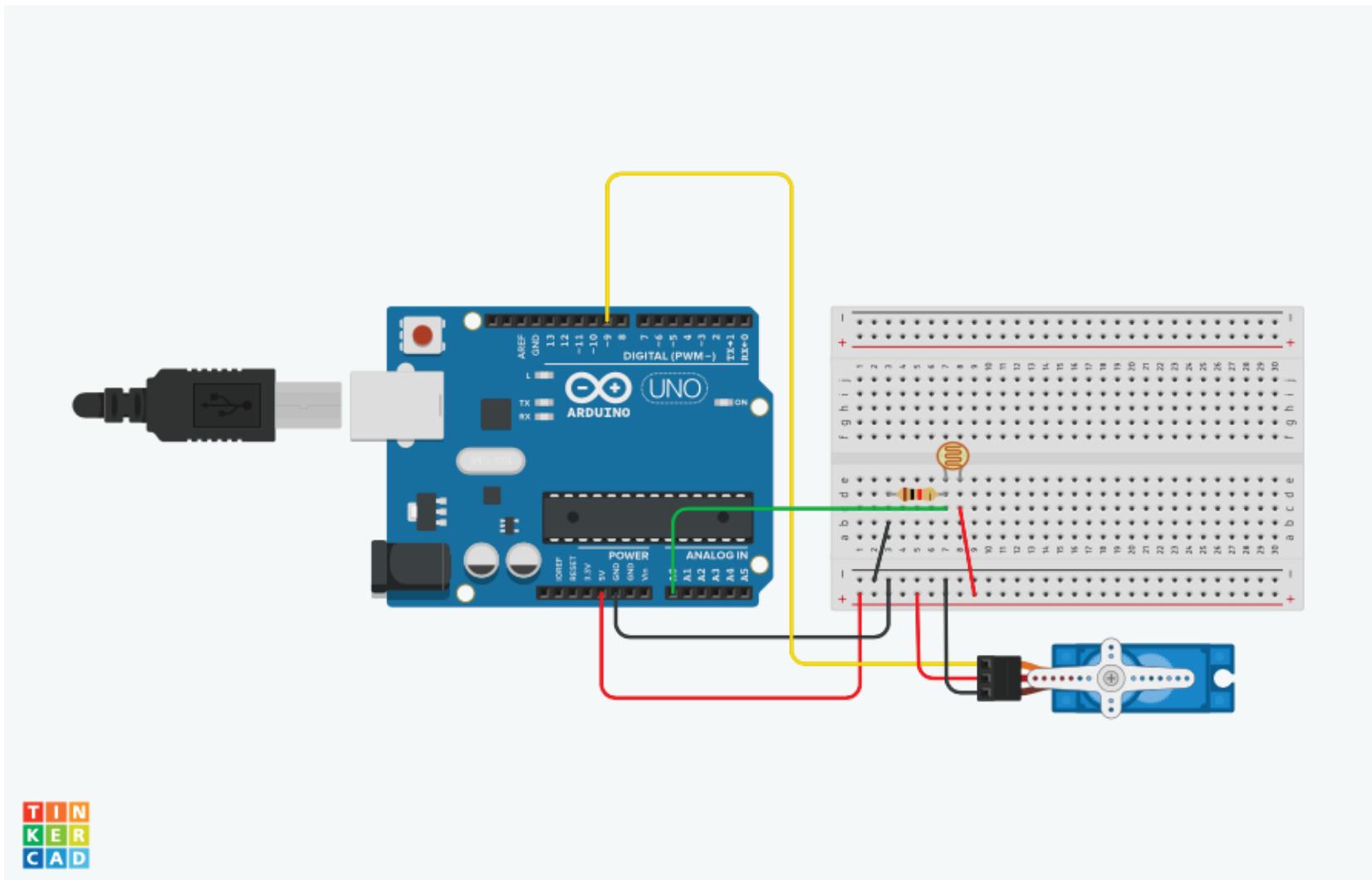
Servo myservo; // create servo object to control a servo
// twelve servo objects can be created on most boards

int pos = 0; // variable to store the servo position
int sensorPin = A2;
int sensorValue = 0;

void setup() {
  myservo.attach(9); // attaches the servo on pin 9 to the servo object
  Serial.begin(9600);
}

void loop(){
  myservo.write(90);
  sensorValue1 = analogRead(sensorPin);
  delay(500); //wait half a second in between reading the value from photoresistor
  sensorValue2 = analogRead(sensorPin);
  if (sensorValue1-sensorValue2 < -30) { //if the change in brightness is greater than 30;
    for (pos = 90; pos <=180; pos += 1) { // goes from 0 degrees to 180 degrees
      // in steps of 1 degree
      myservo.write(pos); // tell servo to go to position in variable 'pos'
      delay(15); // waits 15ms for the servo to reach the position
    }
  }
  myservo.write(90);
}
```

Circuit



Watch the video @ <https://vimeo.com/241444264>