# 3D Finger Gesture Recognition used in the Manipulation of Floating Images

Sabancı Üniversitesi — FACULTY OF ENGINEERING AND NATURAL SCIENCES

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## ABSTRACT


Today, people want use technological devices without touching or with less physical interaction. Daily technological devices are being adapted to this new demand. In our project we aimed to create a 4-digit clock which the user can change the hour/minute and set an alarm without actually touching it. In our design, the image of the clock is projected to free air, and user can adjust the clock and set alarm by using hand gestures defined by us. We aimed to define gestures that can be easily learned and memorized.

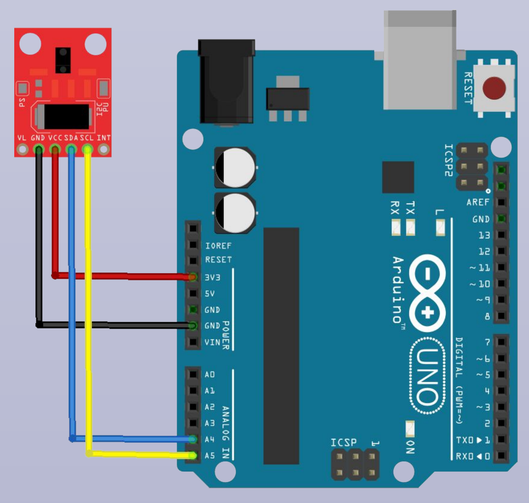


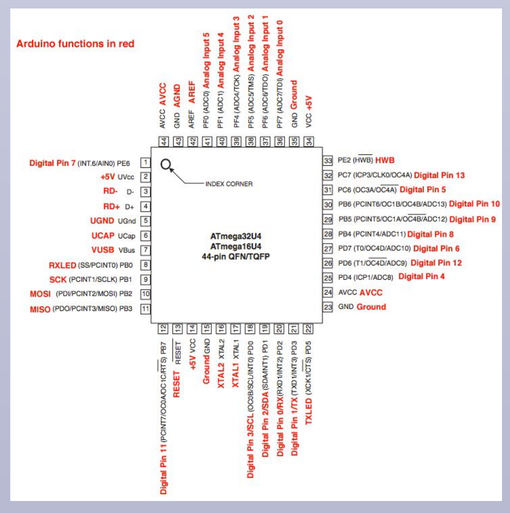

(We will apply this idea to manipulate a clock with this screen)


## METHODS AND MATERIALS

We used Real Time Clock component to get time data, Arduino Leonardo to control the sensors, Time of Flight distance sensor (VL6180X) to locate the hand, 4 digit LED display and gesture sensor (APDS-9960) to define and detect the gestures.

(Overview of our system)




## TECHNICAL DATA

- Arduino micro as a control board:
  - ATmega32U4 32 KBit microprocessor
  - Using SDA/SCL communication port
- 4 Digit Led Display
  - Full Brightness
  - Implemented Clock Data
- Graphs for arranging APDS-9960 gesture sensor:

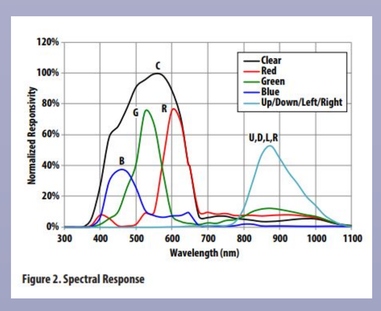


Figure 2. Spectral Response

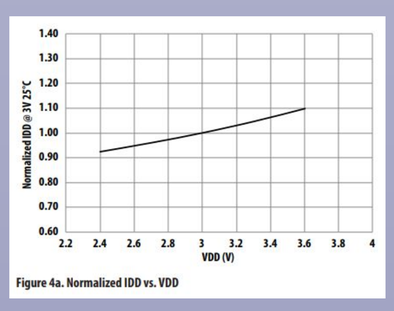


Figure 4a. Normalized IDD vs. VDD

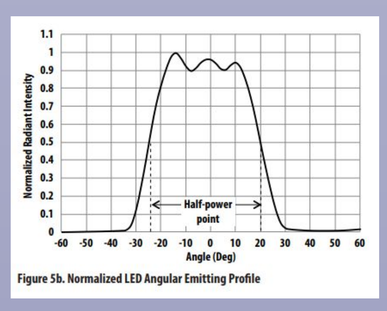


Figure 5b. Normalized LED Angular Emitting Profile

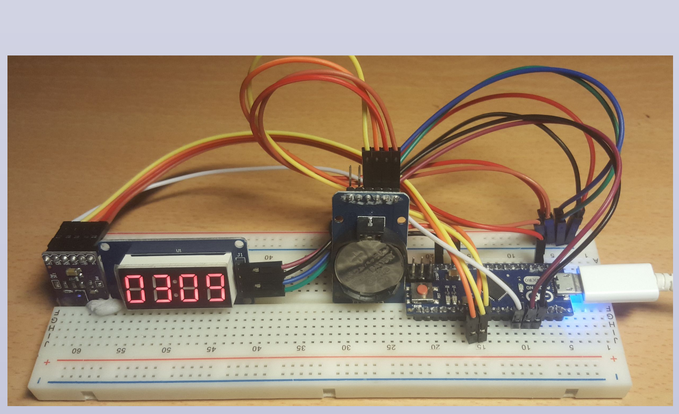
## RESULTS

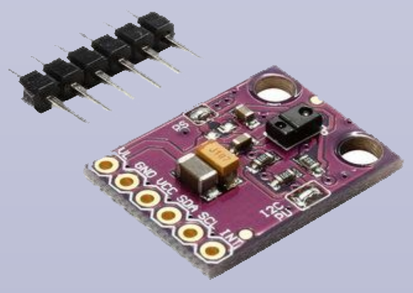
We used the distance measuring sensor to locate the hand, to figure out whether the user wants to change the hour portion or minute portion as well as limiting the operation area. Later on, we assigned modes to up (increase), down(decrease), right(setting mode) and down(save changes). To obtain the 'floating image', we glued a special optical glass on top of the 4-digit display. Sensors are operating on that floating image. We added a buzzer which notifies the user whenever the gesture recognition is used.

## CONCLUSION

What We Learn From Our Project:

- Using Arduino Board and sensors asa a base processing unit
- Coding arduino ide based on algorithms
- Mapping the coverage area
- Implementing gesture to code
- Finding best solution and gestures to using as a daily driver
- How to convert 2D images to Floating images


## FUTURE WORK

We will be working on,

- Reducing the cost by using only one sensor and possibly find a cheaper option.
- Faster response when changing mode and adjusting time.
- More minimalistic and aesthetically appealing design.
- Increase the sensitivity of the sensor and detect faster moves.

## REFERENCES


- http://pure.sabanciuniv.edu/project/77/3d-finger-gesture-recognition-used-manipulation-floating-images
- https://www.sparkfun.com/products/12787
- https://www.st.com/resource/en/datasheet/vl6180x.pdf
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