



# Sensors Intro

Presentation by:  
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# Color Sensors

## Rev Color/Range

- Measures RGBA (red, green, blue, alpha)
- Functions as a distance sensor as well
- Cost: \$14.00



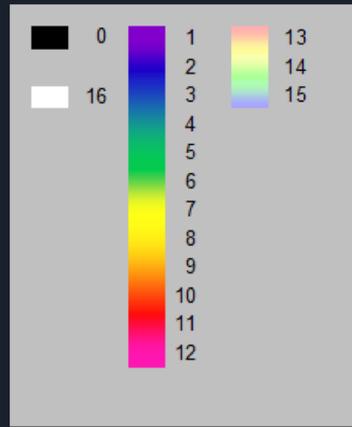
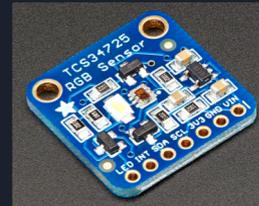
## Modern Robotics Color

- Returns “color value” between 0 and 16
- Can also return RGB values
- Cost: \$36.95



## Adafruit RGB

- Measures RGB & clear light values
- Cost: \$7.95



# Distance Sensors

## Rev Color/Range

- Detects from 5-25 cm
- Cost: \$14.00



## Modern Robotics Range

- Detects from 1-255 cm
- Uses optical detection from 1-5 cm, ultrasound for other distances
- Cost: \$44.95



## Maxbotix Sonar Range Finder

- Detects up to 6.45 m away
- Very good at detecting small objects
- Multiple models with varying fields of view
- Cost: \$24.95



## Rev 2m Distance Sensor

- Detects from 5-200 cm, 1 mm resolution
- Uses lasers and time-of-flight
- Cost: \$18.00



# Heading/IMU Sensors

Most IMU sensors include:  
accelerometer, gyro, rotational  
velocimeter, and z-axis heading  
detector.

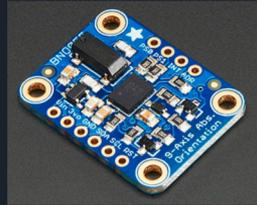
## NavX Navigation

- Very accurate measurements
- Longer initialization
- Requires external drivers (No OnBot)
- Cost: \$99.00



## Adafruit BNO055

- Moderately accurate measurements
- Built into Rev Expansion Hub
- Cost: \$34.95 (Rev Hub Cost: \$150.00)



## Modern Robotics Integrating Gyro

- Poor accuracy
- No accelerometer
- Cost: \$32.95



# Utilizing the Robot Controller's Camera

Vuforia <https://www.vuforia.com/>

- Free to access
- Track any 3D object or 2D image
- Speeds up the process from development to testing
- Interfaces well with android bitmap and color classes

## Phone Camera

- If using, try to have a phone with a larger sensor for darker environments and capability for higher resolution video.





# Accessing Vuforia SDK

Vuforia is already included in the latest version of the robot controller but the SDK can also be accessed at

<https://developer.vuforia.com/downloads/sdk>

You will have to login or create an account to access the SDK and create a license key here

<https://developer.vuforia.com/targetmanager/licenseManager/summaryForFreePlan>

Instructions for installing the SDK can be found here

<https://library.vuforia.com/articles/Solution/Getting-Started-with-Vuforia-for-Android-Development#installation>



# Creating/managing Vuforia Targets

Navigate to Vuforia's target manager which is available on their website. An account and a license key will also be required for this step.

<https://developer.vuforia.com/targetmanager/project/checkDeviceProjectsCreated>

Next, you will click "Add Database"

Name your database and select "Device"

You should now be able to upload your trackable image or file

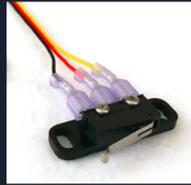
Custom 3D objects will have to be scanned using Vuforia's object scanner tool or their model target generator. The downloads are available on Vuforia website

<https://developer.vuforia.com/downloads/tool>

## Other Sensors

### Touch/Limit Switch

- Simple digital sensor with a switch
- Can limit motion or detect collisions
- Cost: 2 for \$12.95



### Sharp Proximity

- Detects when an object is within either 10 or 15 cm (depending on model)
- Cost: \$5.95



### Modern Robotics Optical Distance

- Detects reflected light (whiteness)
- Max range of 8 cm
- Cost: \$26.95





# Conclusion

We introduced color, distance, and IMU sensors, as well as utilizing the phone camera.

We used a robot to demonstrate how the IMU can be used to drive straight.

Sensors make your robot smart!

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