


## 1. Physically build your collision avoidance bot:

- one 6x4 piece of cardboard or foam board
- one “Funduino” arduino  $\mu$ controller, mounted as shown
- one ping sensor (“eyes”), DO NOT PLUG IN until step #3b
- two continuous rotating servos, mounted as shown
- one red LED laser (3-5v 5mWatt)
- one 9v battery & holder
- two milk jug caps (for wheels) hot glued to servos
- one soda bottle cap (as “rear dragger” )

### **TA SIGN-OFF:**


*WARNING: DO NOT POWER UP or plug in USB until TA has inspected and signed off above.  
DO NOT plug in ping “eyes” sensor or laser until after step 3a) is signed off.*

## 2. Test Arduino board & arduino software install


- Start your arduino software
- Load “2\_blink” from github site, (if off line, use from menu File / Examples / Basic / Blink .
- Test by clicking the compile  button and verify LED 13 is blinking
- Verify by changing the blink speed (with the delay() function ) **TA SIGN-OFF:**

## 3. Upload ping sensor & laser code to Arduino, then test

3a) Download, save and compile/run 3\_ping\_US-100\_and\_laser code

- Copy 3\_ping\_US-100\_and\_laser code from github repository from its  code listing:  
[https://github.com/LetsCodeBlacksburg/LCBB\\_arduino-collision-bot](https://github.com/LetsCodeBlacksburg/LCBB_arduino-collision-bot)


- Paste code into a “File / New” arduino window (but DO NOT CONNECT ping sensor or laser yet!)

- Compile  and verify code has uploaded.
- Disconnect USB power before 3b)

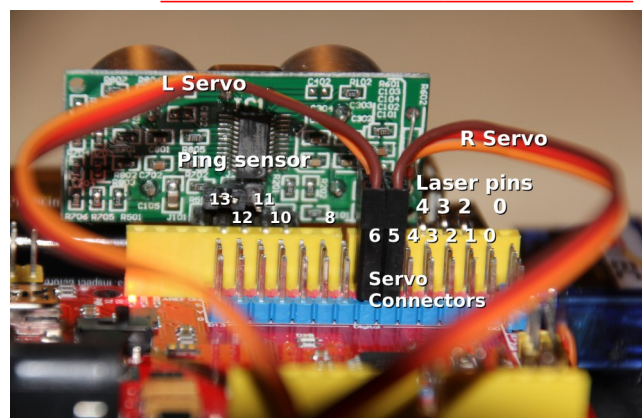
### **TA SIGN-OFF:**

3b) Connect the ping sensor and laser, and test:

- Connect the ping sensor to pins 10, 11, 12, 13 and laser to pins 2,3, 4 (as shown)

- Connect USB power and test sensor, using the serial monitor  to see the sensor readings and watch for laser blasts.

### **TA SIGN-OFF:**



- After* TA sign-off of step 3b), save your ping/laser code with a meaningful file name
4. **Connect the two servos to the servo-headers 5&6 (with USB disconnected)**
- Start a new code window (File / New)
  - Connect the servos (while arduino is unplugged/powered off) as shown in pin-out diagram (above).
  - Copy the “4\_two-servos-test.ino” servo test code from github URL (above)
  - Calibrate your stopL and stopR, numeric values until your servos both stop when stopAll() is called.
- Demonstrate working forward(), stopall(), turnL() and turnR() functions, and get TA sign-off:

**TA SIGN-OFF:**

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*NOTE: You may need electrical tape around your wheels if you're running your bot on a shiny or smooth/slippery surface like tile or hardwood floors.*

**BOT CHALLENGE:** Using the two-servo-test code, try to program your bot to move around to form a 2 foot x 2 foot square

**TA SIGN-OFF:**

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## 5. Make Your Bot Smart - Combine Servo Code & Ping Sensor Code

### 5a) For Experienced Coders – Combine your ping & servo code

Combine your ping sensor and servo code you previously saved to make your bot stop, scan for obstacles, and navigate the room without hitting anything.

*hint: move forward() in a while/getDist() loop.*

### 5b) For Less Experienced Coders – Download already working code *[CURRENTLY INOPERATIVE]*

For ready to use, fully autonomous working code, see “5a\_collision-bot\_complete.ino” from [https://github.com/LetsCodeBlacksburg/LCBB\\_arduino-collision-bot](https://github.com/LetsCodeBlacksburg/LCBB_arduino-collision-bot), re-tune your servos and make your bot roam around the room and avoid obstacles.

*NOTE: The old 5b\_collision-bot\_complete.ino code does not have the laser code built in. Can you add a laserFire() function? (hint, look back at your saved ping/laser code)*

### 5c) For “Mission to Mars” Functionality – Download Laser-Bot Code

Download the ready to use “5c\_Laser\_Bot\_Mission\_to\_Mars.ino” code to get all the latest functions that will give you a ready to program bot with laserFire() function already set up. But there's a problem with the laser configuration. Can you find out and fix what's wrong?

**TA SIGN-OFF:**

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### **Optional “Mission To Mars” Laser-Bot Challenge (if class is set up)**

**SAVE THE EARTH!:**

Your Mars rover Laser-Bot has been sent to Mars to stop an alien invasion force from attacking Earth! Can you navigate the mountainous Martian terrain, locate the alien attack armada, and destroy it with your 5,000μWatt laser cannon before they launch their attack?



The clock is ticking! Download, compile and upload the “LCBB\_Laser\_Bot\_Mission\_to\_Mars.ino” code to your laser-bot. Quickly figure out why your Mars Laser-Bot's laser is malfunctioning, fix the laser (in code), and program your bot to navigate the mountainous Martian obstacle course to the alien ship and take it out with your 5000μWatt laser cannon before they launch their attack on Earth! **TA SIGN-OFF:**

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