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For BugBrain™ Users

# Robot Newsletter

*"I have never  
let my  
schooling  
interfere with  
my  
education."*

— Mark Twain

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Robotics Newsletter

## DARPA's Million-Dollar Great Race

In March 2004, DARPA plans to hold a race between Los Angeles and Las Vegas for autonomous ground vehicles. A cash award of \$1 million will be given to the team that is first across the finish line within the specified time limit.

Check it out at:

<http://www.darpa.mil/grandchallenge>

## Don't Forget to Register!

When you register, you'll always know what's new with BugBrains.

- Get notification of new features, parts, and accessories
- Get sample code you can use with your BugBrain
- Get pictures and tips about what other BugBrain owners are doing
- Find out about Contests
- Learn from FAQs and Q&A columns
- Send in your own questions
- Learn about special discounts and sales
- Tell us what you want to see next!



You can register by sending in the form in the front of your BugBrain Resource Manual. If you can't find it, email us at [robots@YostEngineering.com](mailto:robots@YostEngineering.com) with the following information:

- Your name
- Your age (if under 18)
- Parent name (if under 18)
- Address
- City
- State
- Zip
- Country
- Phone
- Email
- Where you bought your BugBrain

## Awards & Kudos

Kyle S., in Lucasville, OH, recently let us know that he was a top finisher in his school's science fair, with a project based on BugBrain. He advanced to both the County and District competitions. He didn't get to continue to the State level because of his age. Great job, Kyle! We hope to see you doing great things!

*Have you done something cool with a BugBrain? Tell us!*  
[robots@YostEngineering.com](mailto:robots@YostEngineering.com)

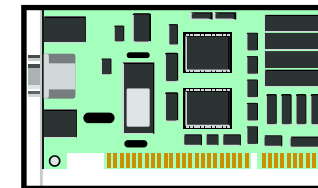
## Next Contest Deadline: June 30, 2003

Does your BugBrain look amazing? Did you program it to do something new and different? Tell us about it, and you could win a prize!

Besides, all participants get their name and BugBrain picture on our webpage, so go ahead and show off your creation!

Enter by sending your name, address, age, and email address, along with pictures and programming code (for Bug-Attack contest) to:

[robots@YostEngineering.com](mailto:robots@YostEngineering.com)



*Finished Building Your BugBrain?  
Show it off!*

Be sure to specify which contest you are entering (you may enter both):

**Picture-Perfect Contest:** send us one or more pictures of your assembled BugBrain, showing off your personalized body parts or decorations. One winner gets a \$50 Amazon.com gift certificate. One runner-up gets a \$25 gift certificate.

**Bug-Attack Contest:** send us pictures of your BugBrain in action, along with the code that makes it happen (specify whether or not we can share the code with others). One winner gets a \$75 Amazon.com gift certificate, and one runner-up gets a \$50 gift certificate.

## Decorating Ideas...

- Pipe cleaners in various colors wrapped around the legs, antennae, or other body parts
- Beads (wood, plastic, metal) stacked up on the legs or antennas as joints
- Fur or other fabric pieces cut to fit the body or various parts
- Fabric netting and pipe cleaners cut and assembled to make wing appendages on the BugBrain's back
- What else can you think up?

## SUPPORT SERVICES

All robotics and kit purchasers receive unlimited toll-free and email support. If you are having problems with assembly or programming, be sure to include a description of what you are trying to do, the problem or error, and a copy of your program code if it is a programming problem.

We're here to help! (888) 395-9029 or [robots@YostEngineering.com](mailto:robots@YostEngineering.com)

## Recent Tech Questions...

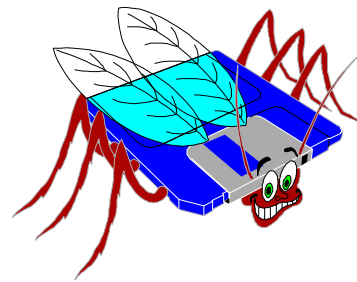
**PROBLEM:** My BugBrain is assembled, but I can't download a program to it. The 4 LEDs on the front light up, but the LED on the processor flashes red and green non-stop. What is wrong?

**ANSWER:** The flashing on the microprocessor means that the processor is running, but is unable to connect. There are three things that you should check:

- (1) Make sure the servos are not plugged in backwards. The black wires on the connectors should be facing the outside edges of the board.
- (2) Inspect the soldering. Check for cold or missing solder joints, or solder that runs across contact pads.
- (3) Make sure that you are using the correct com port on your PC.

**PROBLEM:** My BugBrain does not walk in a straight line — it always goes a little to the left or right. How can I get a straight path?

**ANSWER:** It is very difficult to get a robot walking \*perfectly straight\* because (a) the servos being used are analog hobby servos, not high performance servos — therefore there is a several percentage point variance in their movement from step to step; (b) as the battery levels change, the amount of servo power fluctuates, which causes small differences in the amount of servo movements; and (c) as the robot crosses the walking surface, there will be varying levels of friction by the feet — which means that there will be more or less push by the robot on each side, and not necessarily evenly.



However, given the above realities, here are some suggestions to make your BugBrain walk as straight as possible:

- (1) Make sure that all the legs are the same length, and that the bends in the legs are symmetrical on each side. Put the BugBrain on a flat surface, and look at it from several angles to check for symmetry. If necessary, loosen the set screws and adjust the leg length. You can also bend the legs slightly as necessary.
- (2) If the robot still has a consistent drift to one side or the other, then program it to take an extra step at certain intervals to compensate for the drifting tendency.
- (3) Instead of #2 above, you can make the steps different lengths through the program code, thereby moving one leg more than the others. This also compensates for the drift tendency, but in a much more subtle way as part of the normal stride.

Code Example:

```
call moveservos(0.7,0.65,15) ==> no change to sample code
call moveservos(0.3,0.5,15) ==> the rest of these examples all change the numbers
                                from those given in the sample code. This results
                                in the legs moving different amounts

call moveservos(0.2,0.5,15)
call moveservos(0.2,0.35,15)
```

## Quick Tips for Debugging Software



When a program doesn't run as expected, you can usually look at what it's actually doing, compare it to what you wanted it to do, and then analyze the code to see where it is going wrong.

But when your program won't even compile, there are a couple of things to look for — common mistakes that are easy to overlook, but simple to fix.

### Typos!

Nothing will stop your program faster than typos. For example, if you define Position2, but then later try to modify Psition2, you will get an error ("Unknown identifier" with the name of the unrecognized term).

### Incorrect Naming!

Be careful about naming variables and functions. Do not include spaces or symbols in your names! For example, if you call "MoveServos" but then write a function called "Move Servos," the compiler will give you an error. Names should always start with a letter, and consist only of letters, numbers, or underscores.

## Expansions and Cool Stuff

Zaid S., a BugBrain user in Jordan, wanted to add an Ultrasonic Range Finder to his robot. An ultrasonic range finder works by sending a sound wave (above the range of human hearing) and measuring how long it takes for the wave to bounce back. The longer the bounce, the longer it took to hit an object; therefore, the farther away an object is.

Although many possible ultrasonic devices are available, this information is specifically for the Devantech SRF04 (see ordering information below). To add this device to your BugBrain (v.3.0.2), do the following:

1. Connect pin 11 on the BugBrain expansion connector (X1) to the range finder's "Echo Pulse" pin.
2. Connect pin 12 on the BugBrain expansion connector(X1) to the range finder's "Trigger Pulse" pin.
3. Connect pin 2 on the BugBrain expansion connector(X1) to the range finder's "0v Ground" pin.
4. Connect pin 1 on the BugBrain expansion connector(X1) to the range finder's "5v Supply" pin.



To take a reading from the range finder, you must trigger the "Trigger Pulse" pin (BasicX pin 12) with a 10 microsecond pulse, and then time how long it takes for the "Echo Pulse" pin (BasicX pin 11) to change from a low state to a high state.

The trigger pulse can be achieved using the PulseOut() procedure in the BasicX system library. The echo pulse can be achieved using the PulseIn() procedure in the BasicX system library.

The echo pulse time value is approximately correlated to distance as follows:

100 microseconds	~	3 centimeters
18 milliseconds	~	3 meters
36 milliseconds	~	no object detected

Additionally, you must wait at least 10 milliseconds from the end of the previous echo to the beginning of the next trigger.

Thanks to Zaid, for mentioning his addition to the BugBrain.  
Do you have an idea too? Need help? Want to share? Let us know!

robots@YostEngineering.com

Ordering Information: Devantech SRF04 Ultrasonic Range Finder

Price: Approximately \$30 (USD)

Available from: Acroname, Inc. (<http://www.acroname.com>)  
Mark III Robot Store (<http://www.junun.org>)  
Parallax (<http://www.basicstamp.com>)  
SuperDroid Robots (<http://www.superdroidrobots.com>)