



MailChimp

May 8, 2015

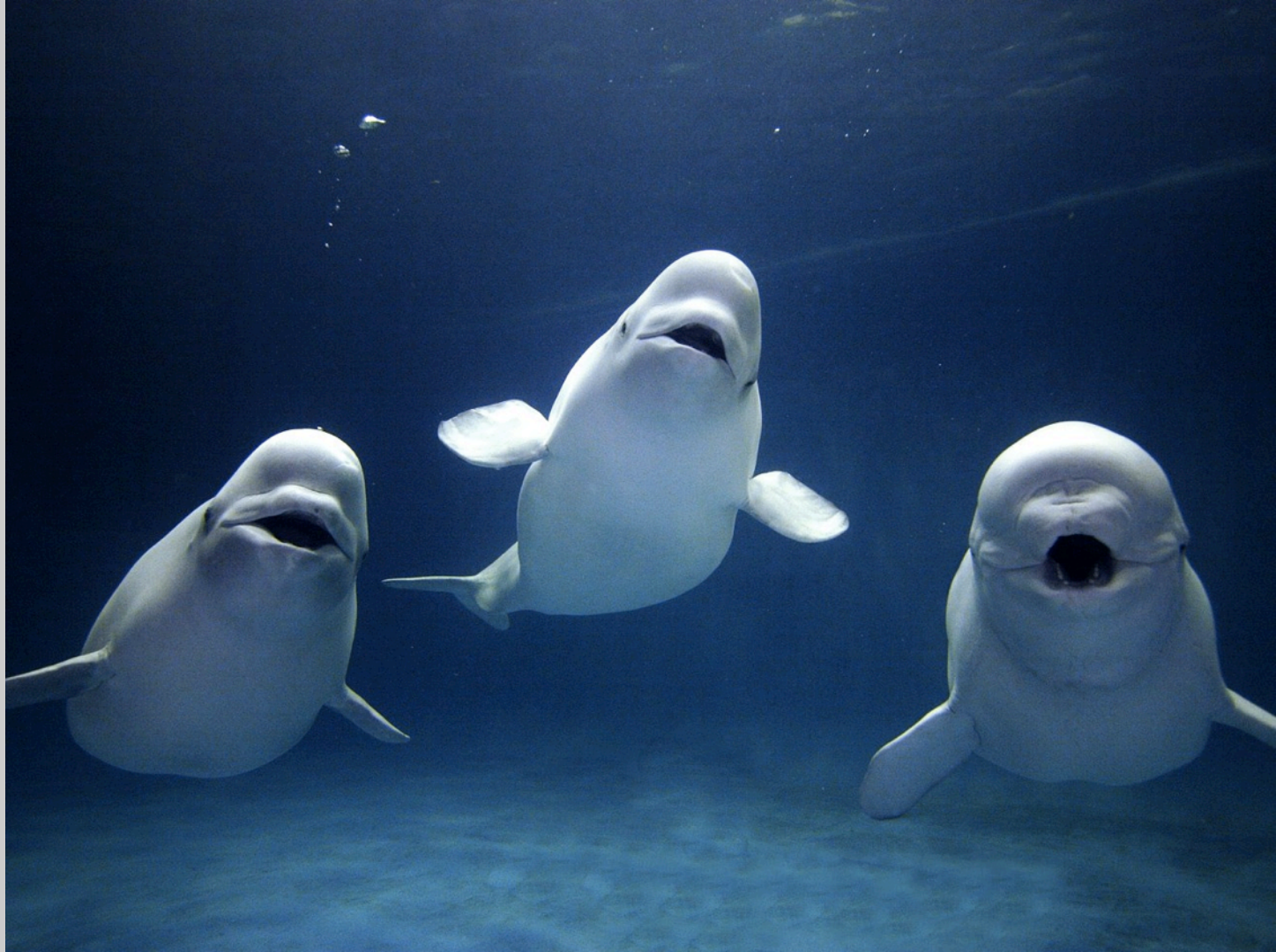
Eric Schweikardt
Founder & CEO



Yes, there is a god, it's
just made of thousands
of tiny robots.





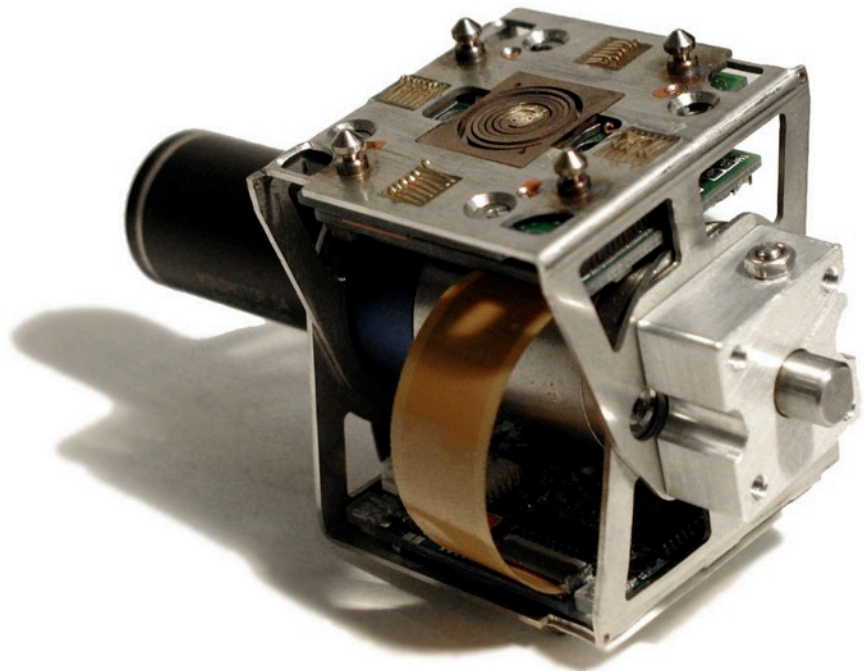




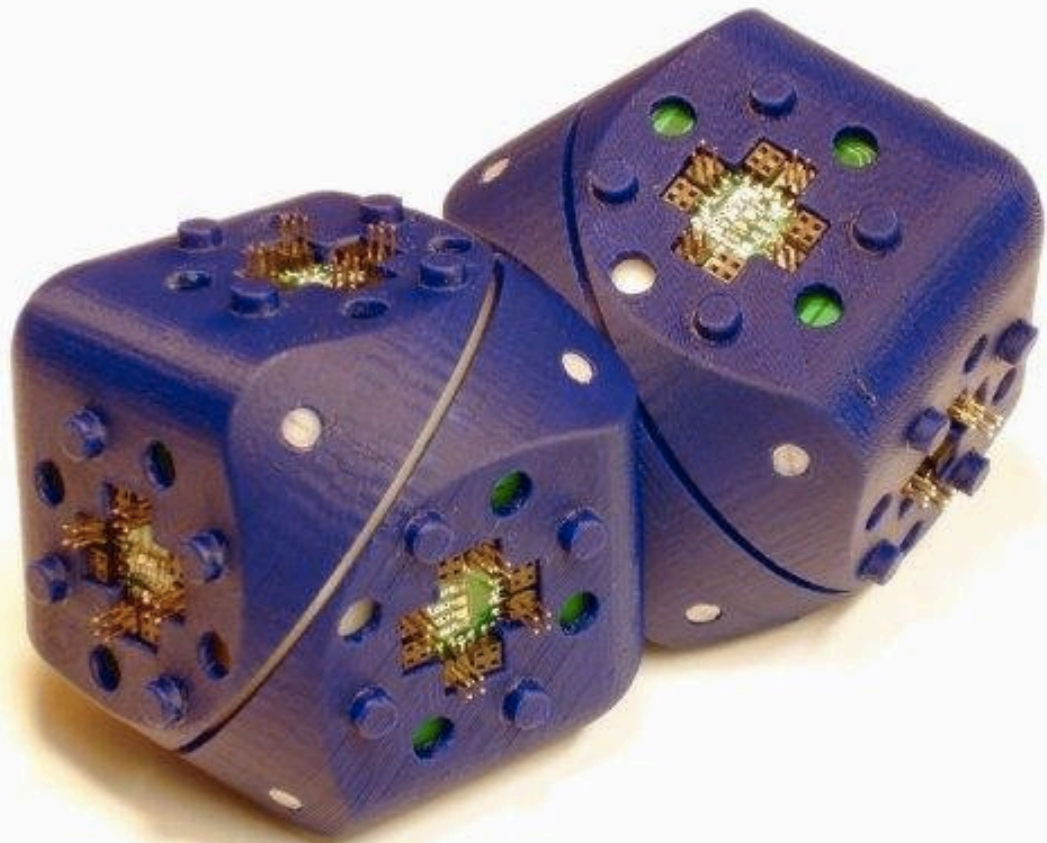


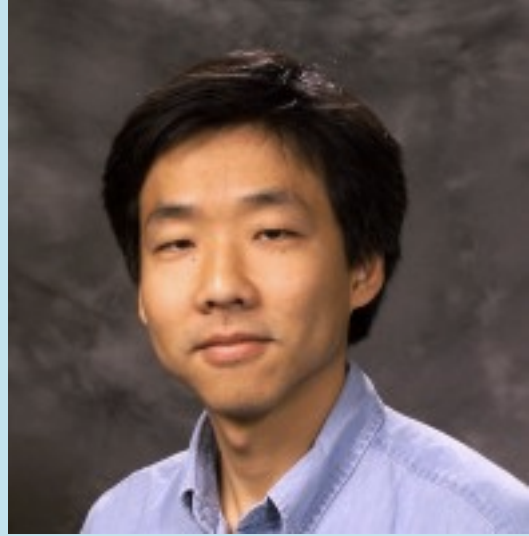
Schweikardt, Eric, and Mark D. Gross. "roBlocks: Understanding Emergent Complexity from the Bottom Up." Robotics: Science and Systems: Workshop on Research in Robots for Education. 2007.











Robots made out of lots of tiny robots are:

- *versatile*
- *reliable*
- *inexpensive*



So, what are we going to do with all of these tiny robots?

So, what are we going to do with all of these tiny robots?

Or, what job will we “hire” these tiny robots to do?

So, what are we going to do with all of these tiny robots?

Or, what job will we “hire” these tiny robots to do?

Or, what problems are these tiny robots going to solve?

Application One:

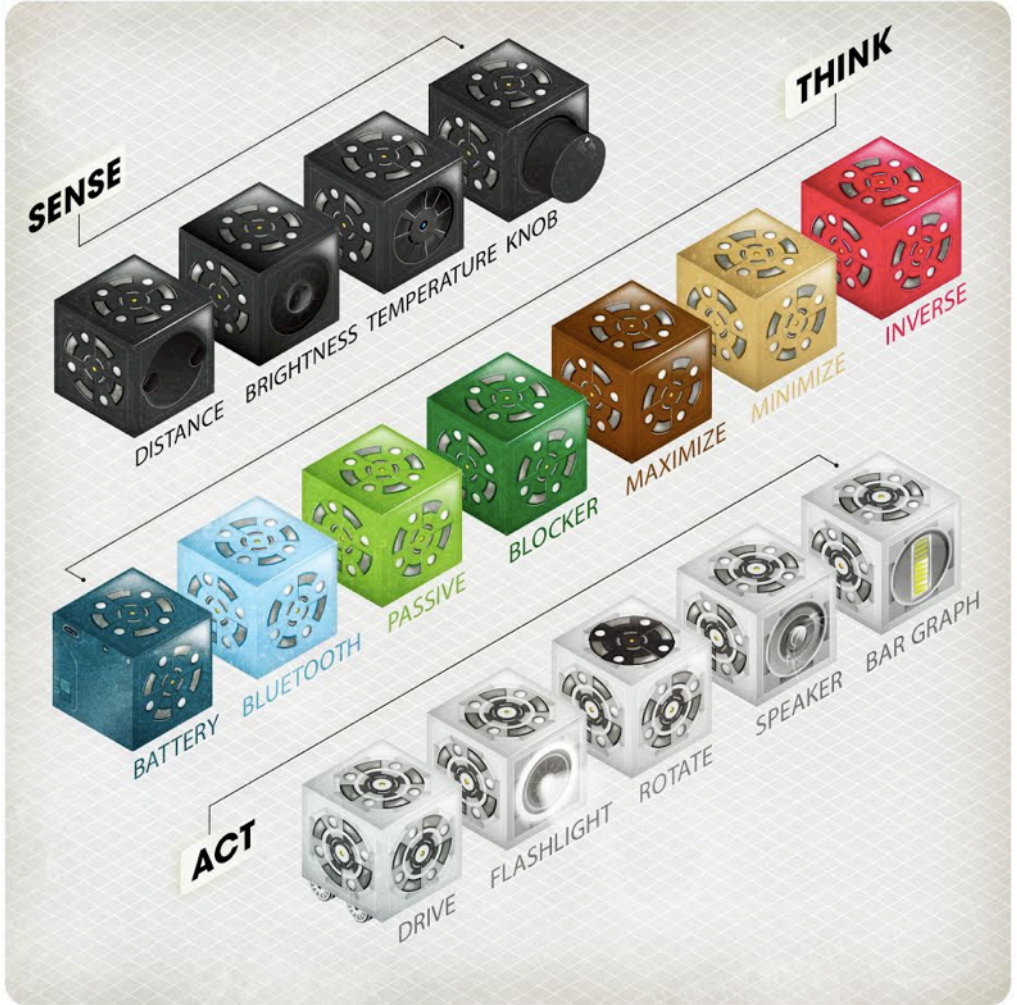
Computational Thinking





cubelets ^{MR}





cubelets MR



\$160



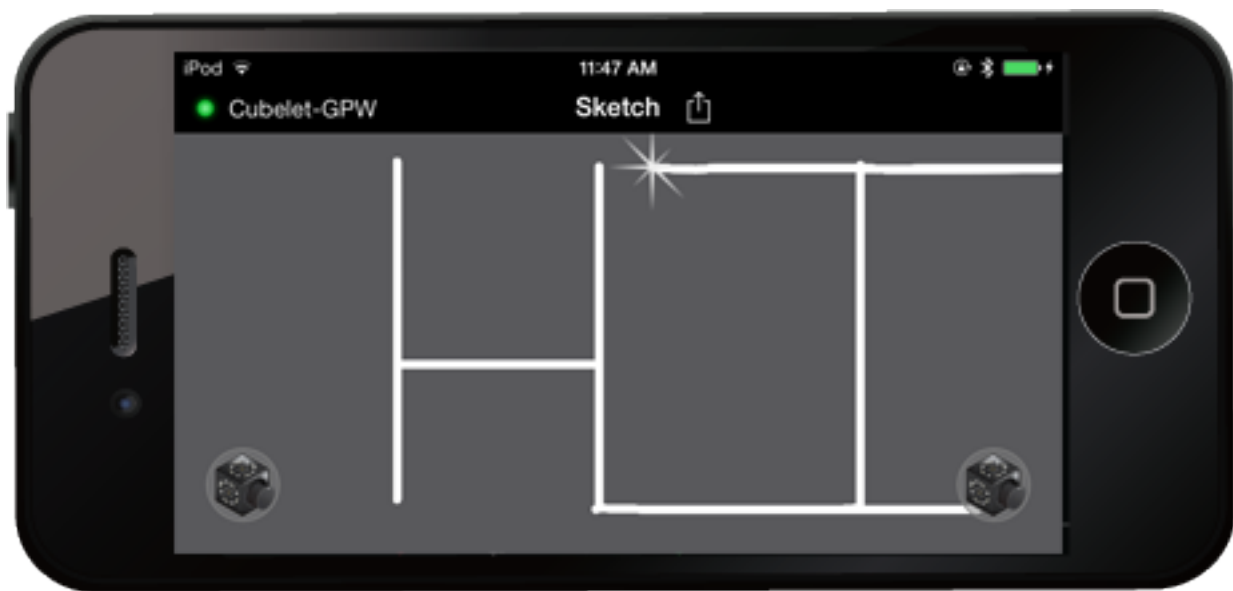
\$500





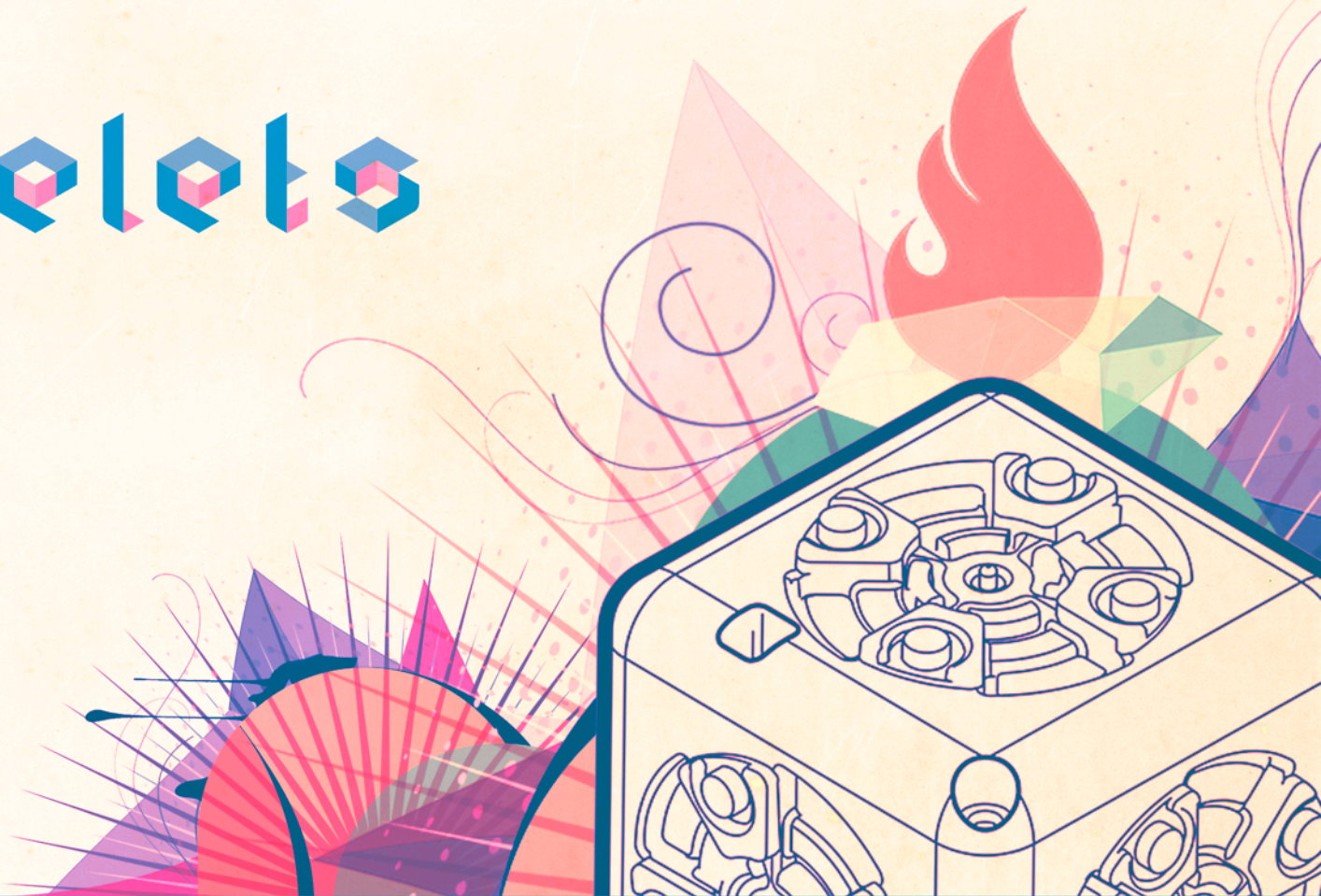
BLUETOOTH
THINK CUBELET







cubelets



Application Two:

Learning About Complexity











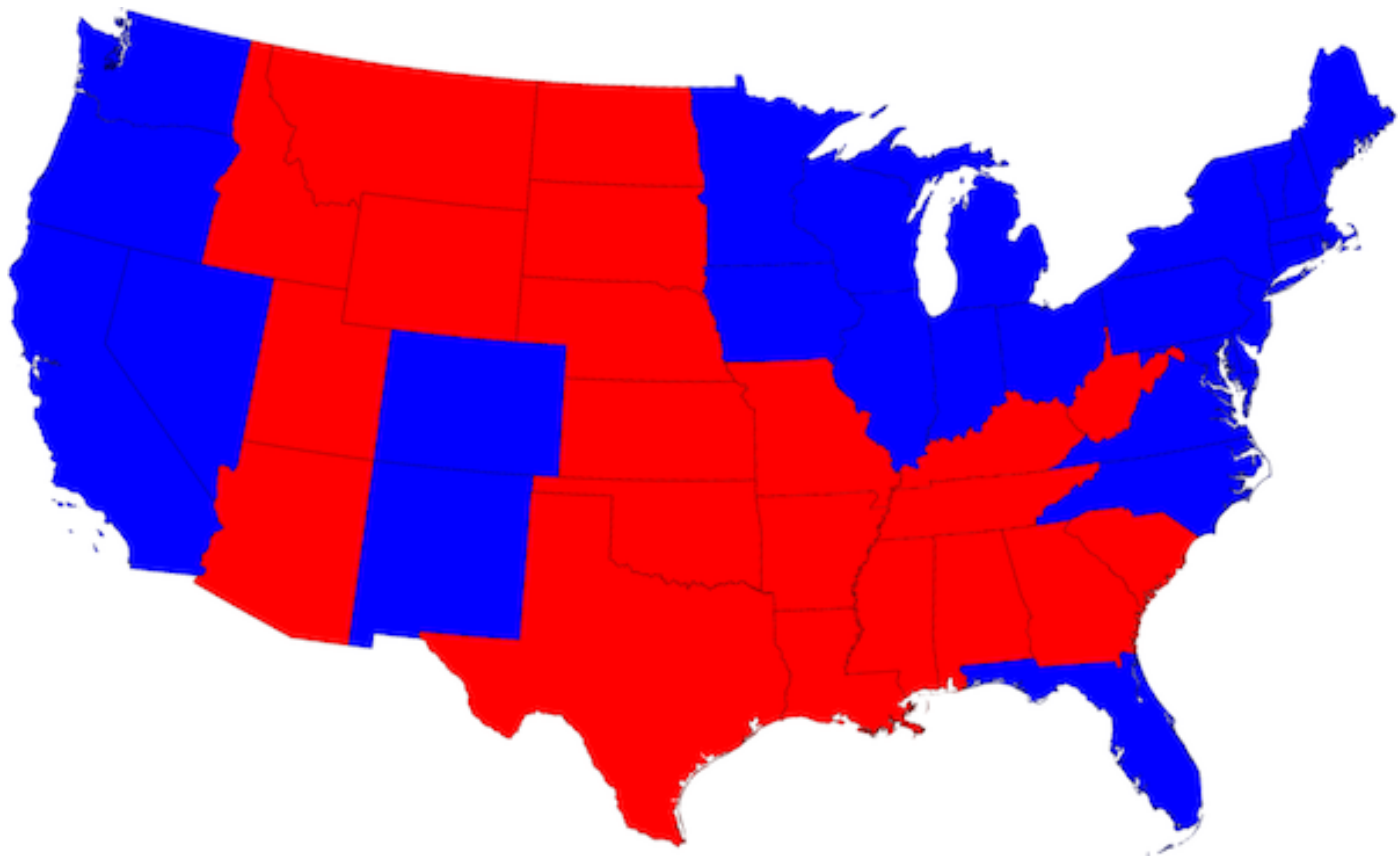


ECONOMY









Speed (%) full speed Patch Size 8

Tools: pencil, eraser, line, arrow, rectangle, filled rectangle, oval, filled oval, zoom in, zoom out

Color selection: gray, star

Color palette: black, gray, white, red, orange, yellow, green, cyan, blue, magenta

5
gray

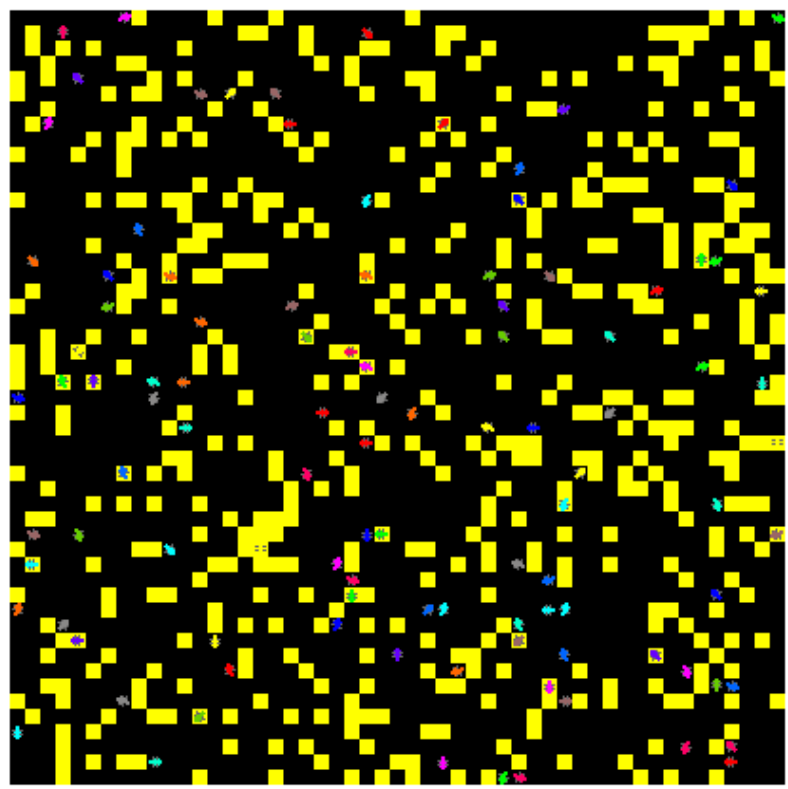
X: Y:

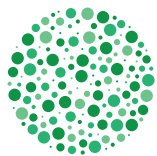
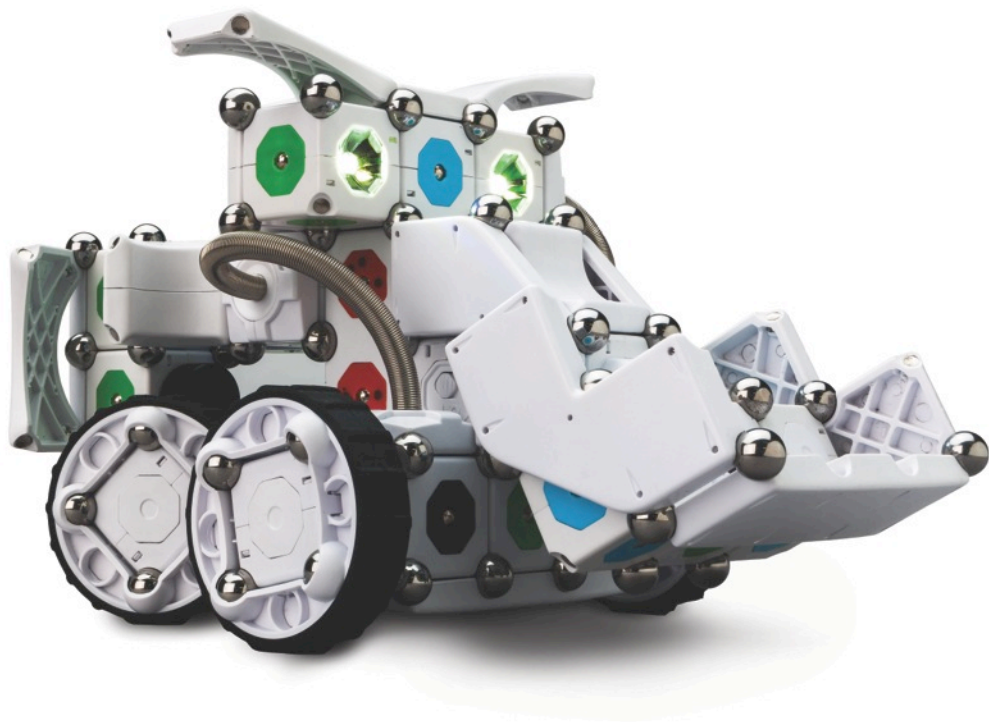
setup

go

number of termites 109

density of wood 20



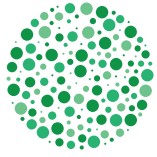


MOSS ^{MR}





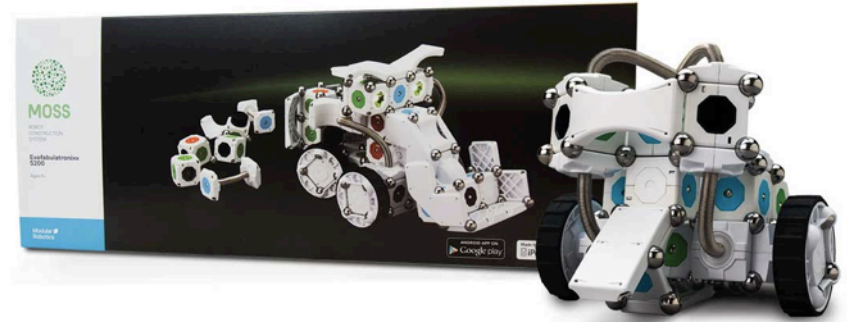




MOSS MR



\$199



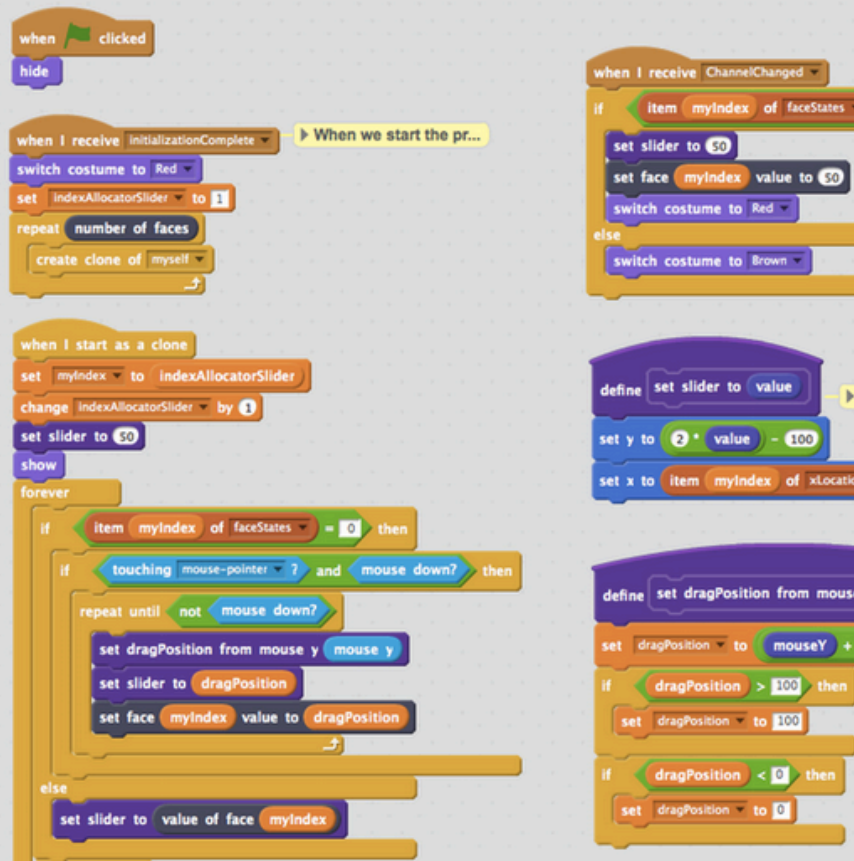
\$499





MOSS





The image shows a collection of Scratch code blocks for a MOSS Scratch project. The blocks are organized into several sections:

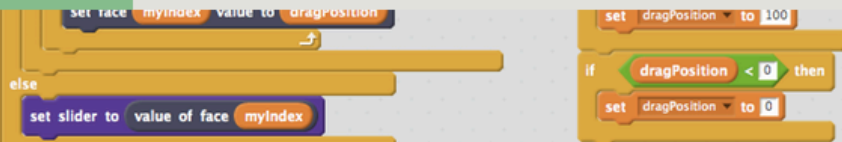
- when clicked:** A 'hide' block.
- when I receive initializationComplete:** A 'When we start the pr...' block, followed by 'switch costume to Red', 'set indexAllocatorSlider to 1', and a 'repeat number of faces' loop containing 'create clone of myself'.
- when I start as a clone:** 'set myIndex to indexAllocatorSlider', 'change indexAllocatorSlider by 1', 'set slider to 50', and 'show'.
- forever loop:** An 'if' block with 'item myIndex of faceStates = 0' then another 'if' block with 'touching mouse-pointer?' and 'mouse down?' then a 'repeat until not mouse down?' loop containing 'set dragPosition from mouse y mouse y', 'set slider to dragPosition', and 'set face myIndex value to dragPosition'. An 'else' block contains 'set slider to value of face myIndex'.
- when I receive ChannelChanged:** An 'if' block with 'item myIndex of faceStates' then 'set slider to 50', 'set face myIndex value to 50', and 'switch costume to Red'. An 'else' block contains 'switch costume to Brown'.
- define set slider to value:** 'set y to 2 * value - 100' and 'set x to item myIndex of xLocation'.
- define set dragPosition from mouse:** 'set dragPosition to mouseY +', 'if dragPosition > 100 then set dragPosition to 100', and 'if dragPosition < 0 then set dragPosition to 0'.



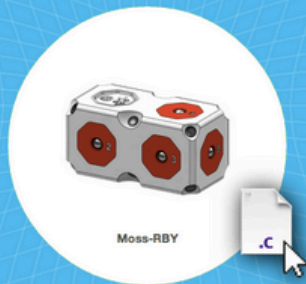
MOSS Scratch

MOSS Scratch is an extension for Scratch that enables programming support for the MOSS Brain. It adds Scratch blocks which can programmatically read inputs from sensors (like the knob, proximity or microphone) and send outputs to actuators (like the spin, pivot, or light). Use your MOSS to draw pictures in Scratch with knobs or proximity blocks, drive your MOSS car around with your keyboard, or build an autonomous exploring robot!

Program With Scratch



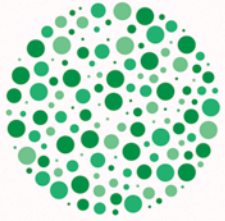
Drop a C file on MOSS.



MOSS Flash

MOSS Flash is a tool that enables you to create new behaviors for your MOSS Brain and bring your robot construction alive using the **MOSS Firmware API**. Drag C programs onto the window, and they will be compiled in the cloud then flashed to MOSS.

Program With C Code



MOSS

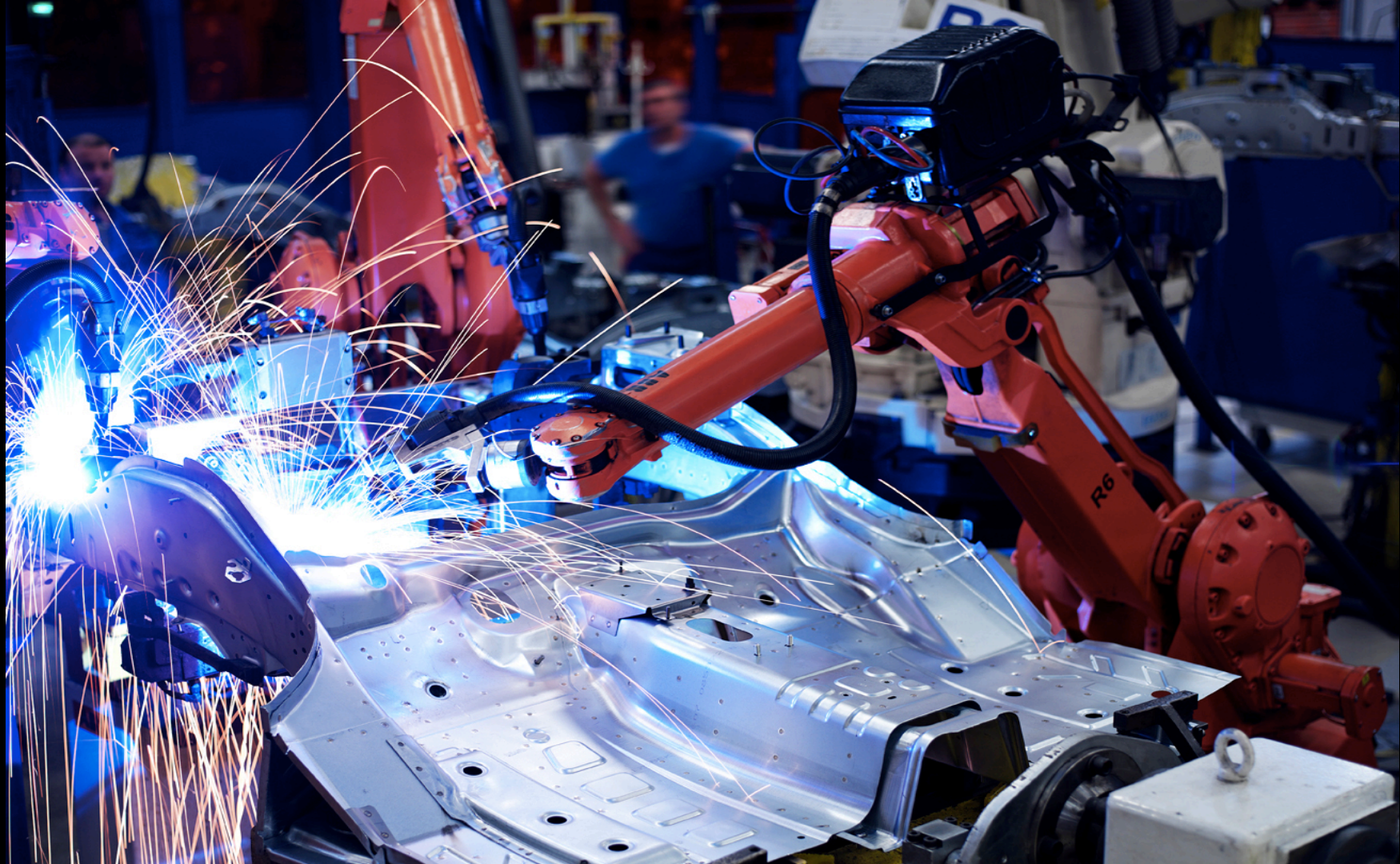




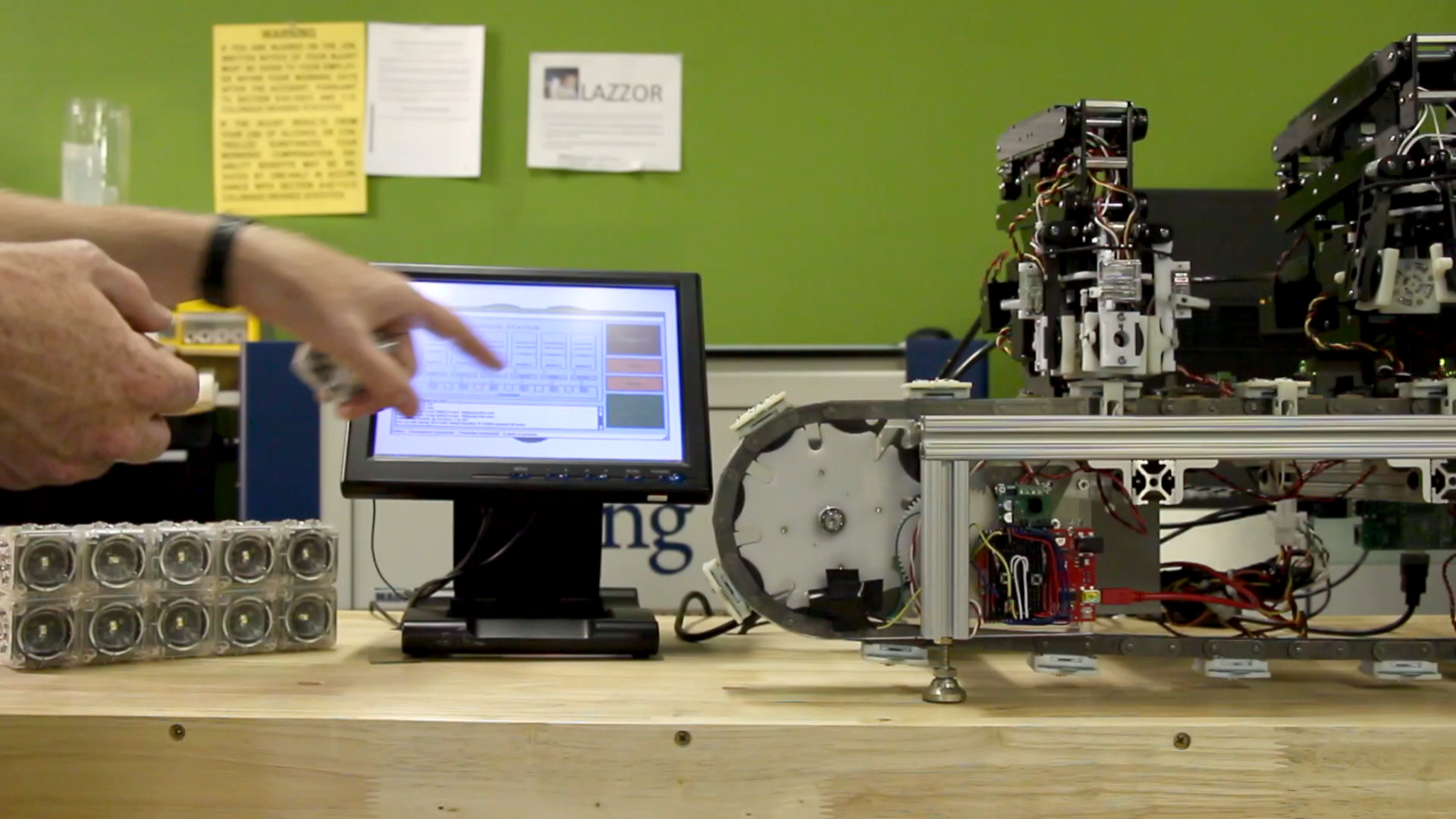
Application Three:

Manufacturing





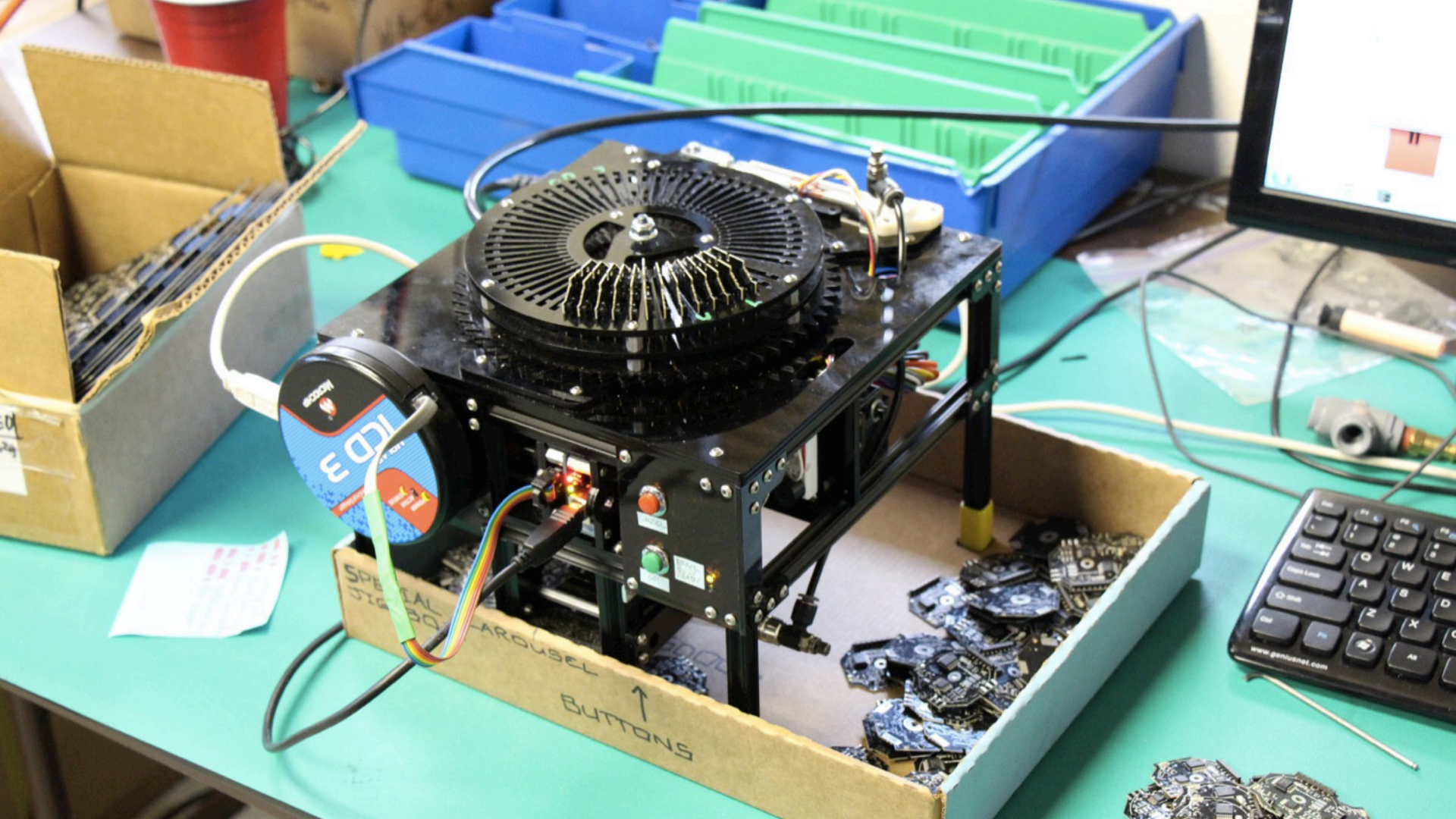
FARKUS

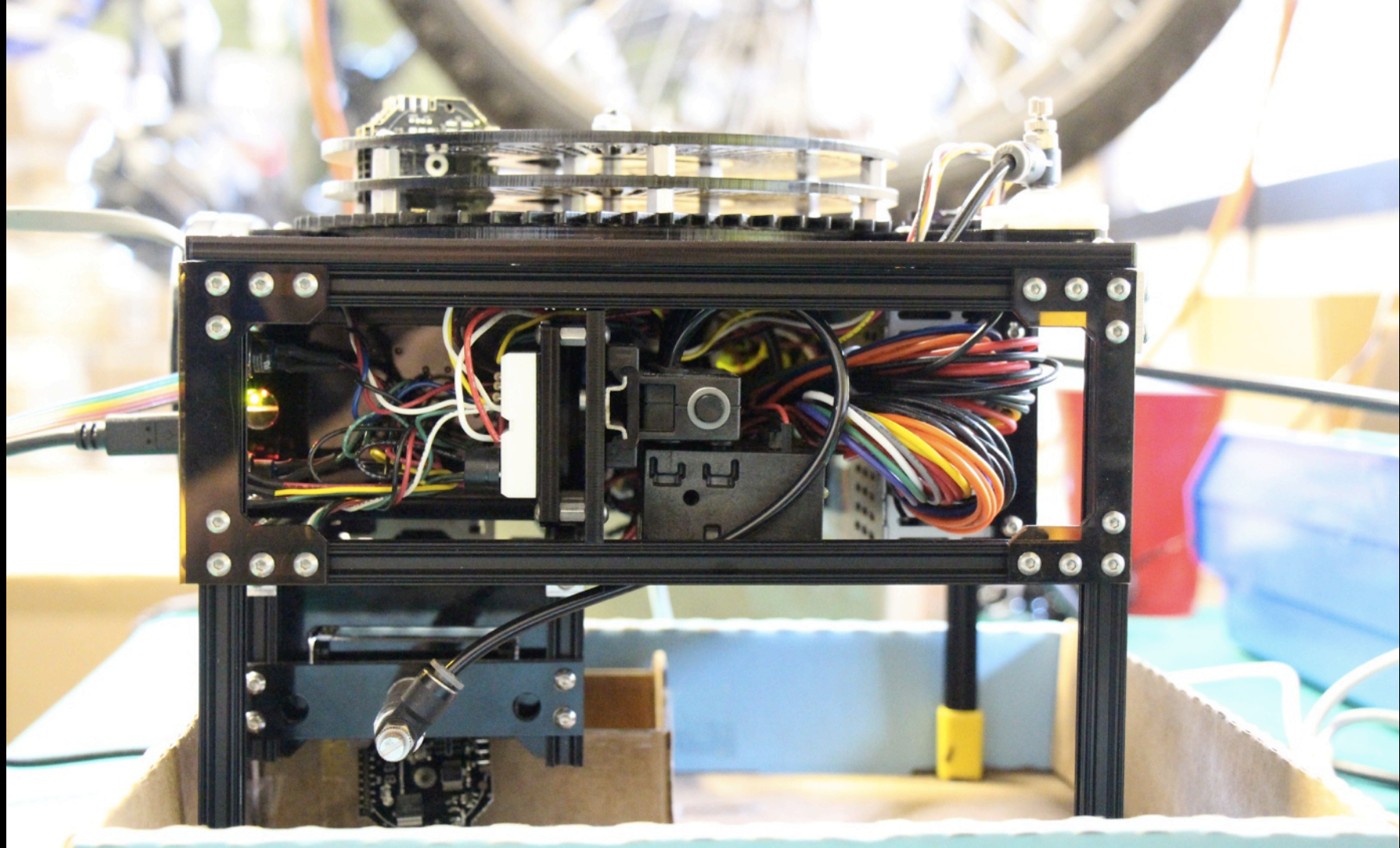


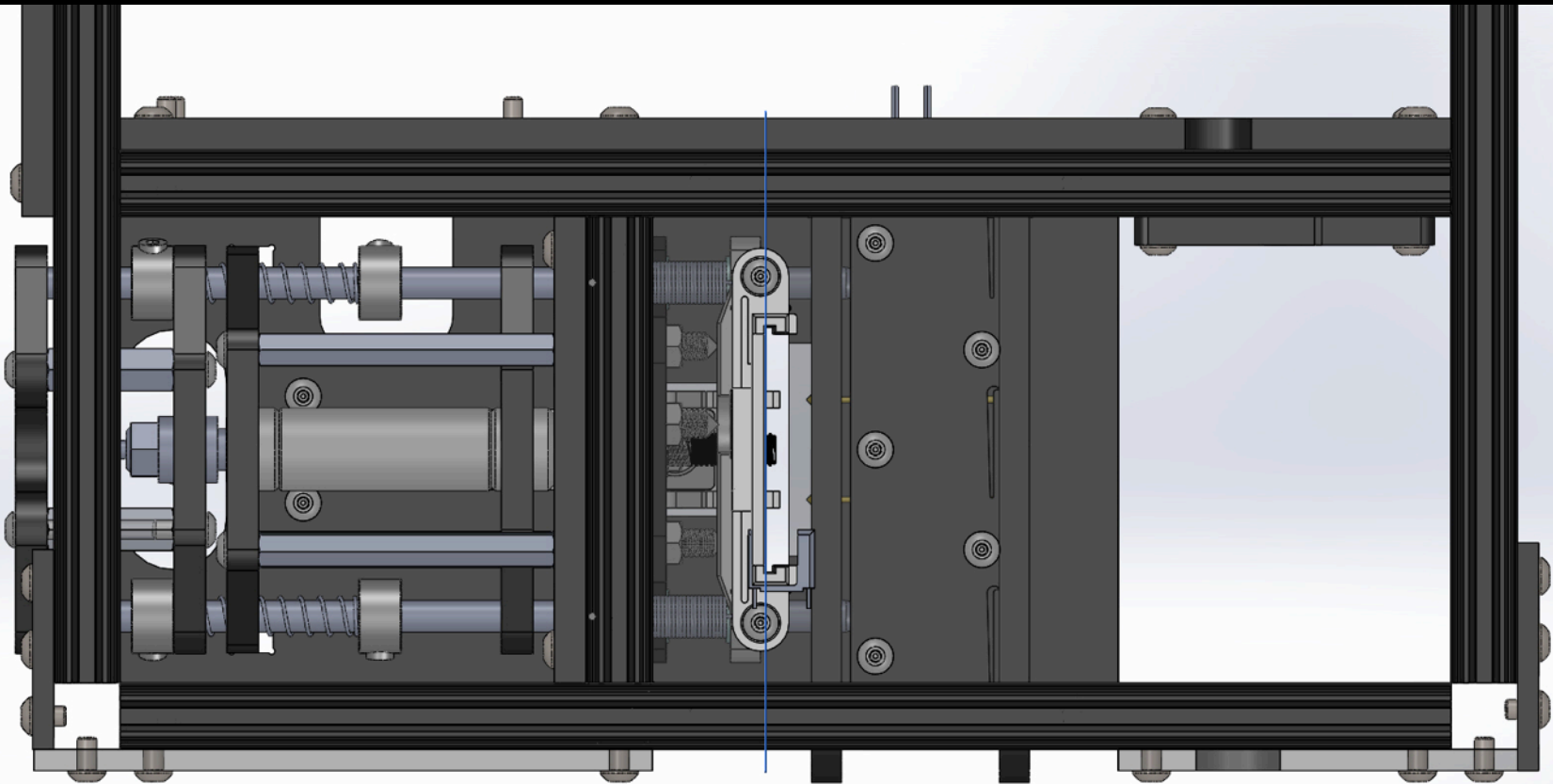
WARNING
A LASER BEAM EMITTED ON THE OPEN
REFLECTING MIRROR OF THIS BEAMER
MAY BE DANGEROUS TO YOUR EYES.
DO NOT STARE INTO THE BEAM.
DO NOT POINT THE BEAM AT OTHER
PEOPLE. THE BEAMER SHOULD BE
USED ONLY BY AUTHORIZED PERSONNEL.
THE BEAMER SHOULD BE USED ONLY
IN A SAFE MANNER. THE BEAMER
SHOULD BE USED ONLY IN A SAFE
MANNER. THE BEAMER SHOULD BE
USED ONLY IN A SAFE MANNER.

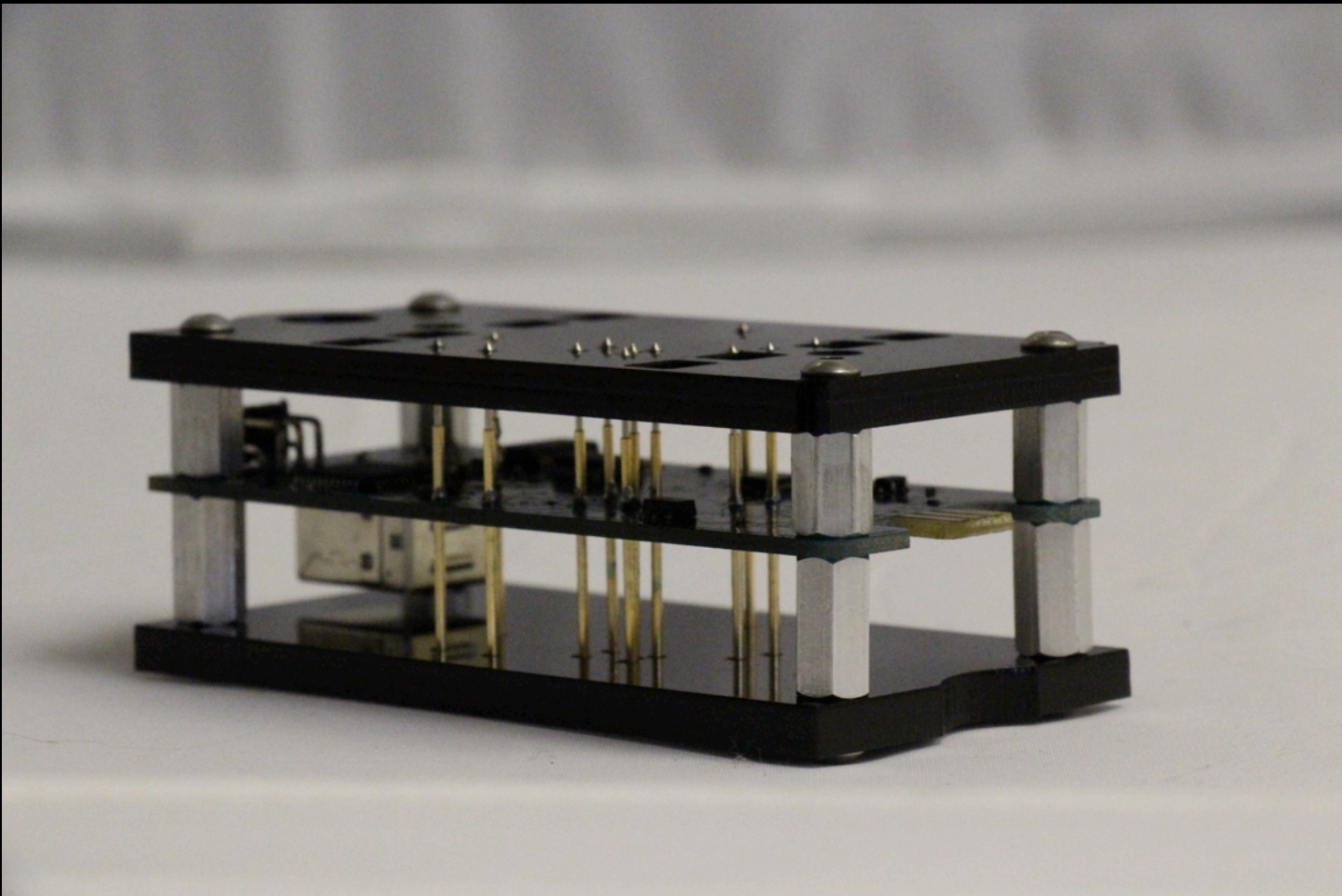
 **LAZZOR**
Lazzor is a leading provider of
robotics solutions for
industrial and commercial
applications. Our robots are
designed to be easy to use,
flexible and reliable. We
offer a wide range of robots
for a variety of applications,
from simple material handling
to complex assembly tasks.

ng

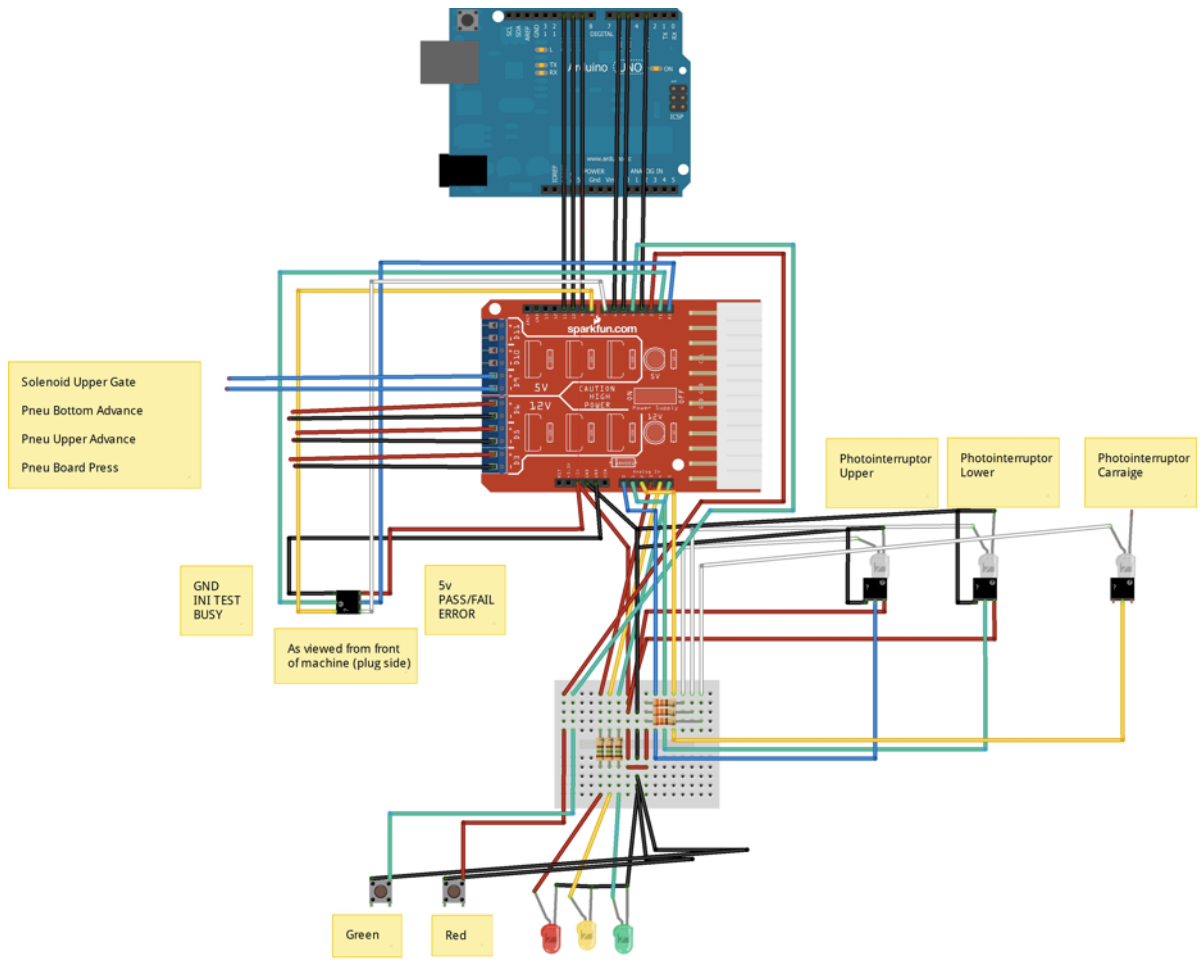












FARKUS Crousel High Level BOM

Item	Cost	Source
Micro ATX Power supply	\$30	Newegg.com
MicroRax struts and connectors	\$50	microrax.com
Acrylic (for laser-cut parts)	\$80	Mcmaster.com
Pneumatic manifold, pistons, tube, fittings, and solenoid valves (3 channels)	\$200	Mcmaster.com
Standoffs, nuts, bolts, springs, shafts, bearings	\$30	Mcmaster.com
Photointerruptors, buttons, LEDs, wires	\$20	Sparkfun.com
Arduino Uno and Power shield	\$50	Sparkfun.com
Solenoid actuator	\$5	Sparkfun.com
3d printed material cost	\$30	Various
Total BOM	\$495	

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Plus about \$8000 in engineering hours

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Plus about \$8000 in engineering hours

We'll need to process 187,120 PCBs to break even.

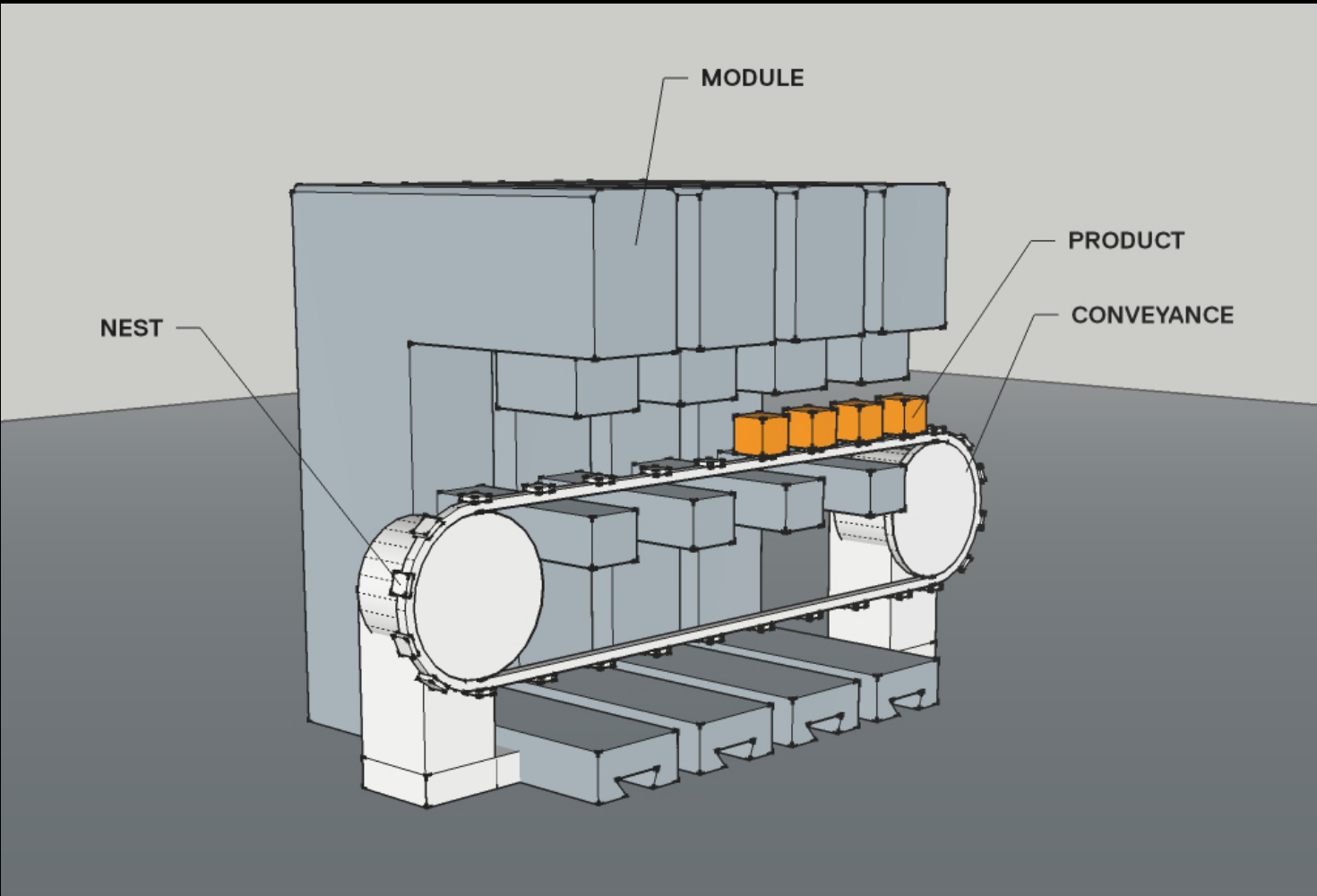
FARKUS Crousel High Level BOM

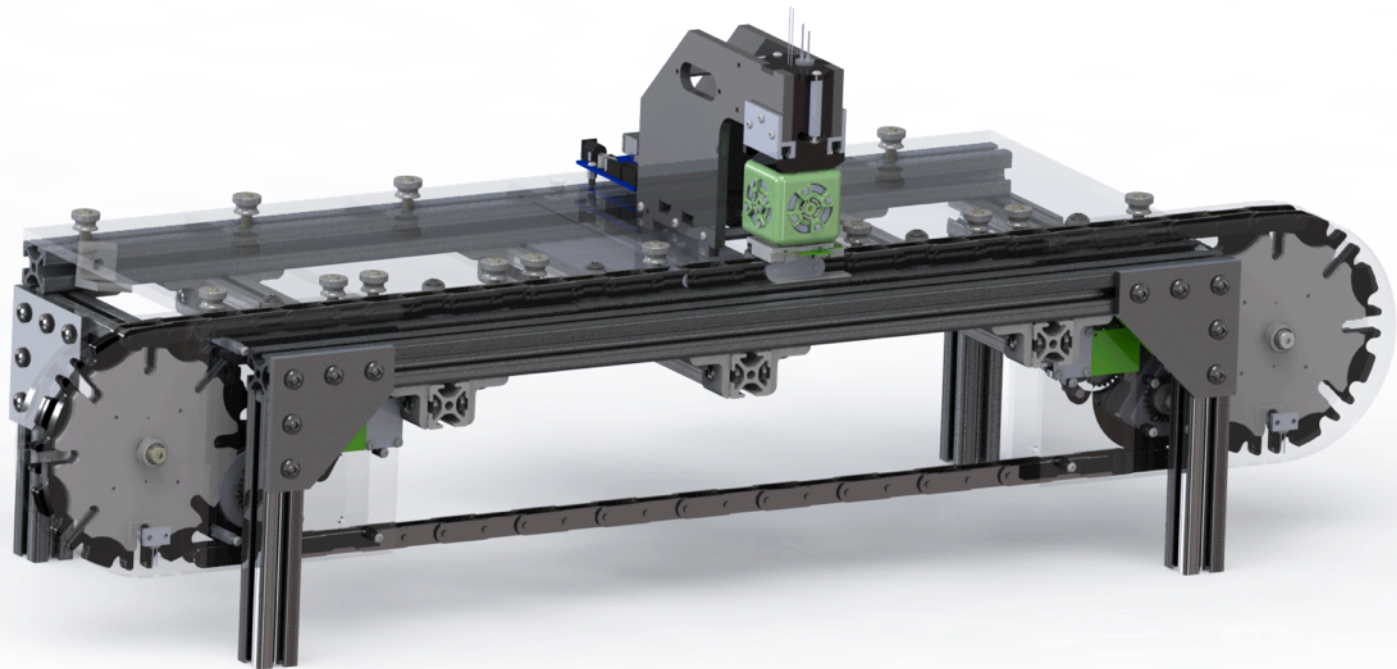
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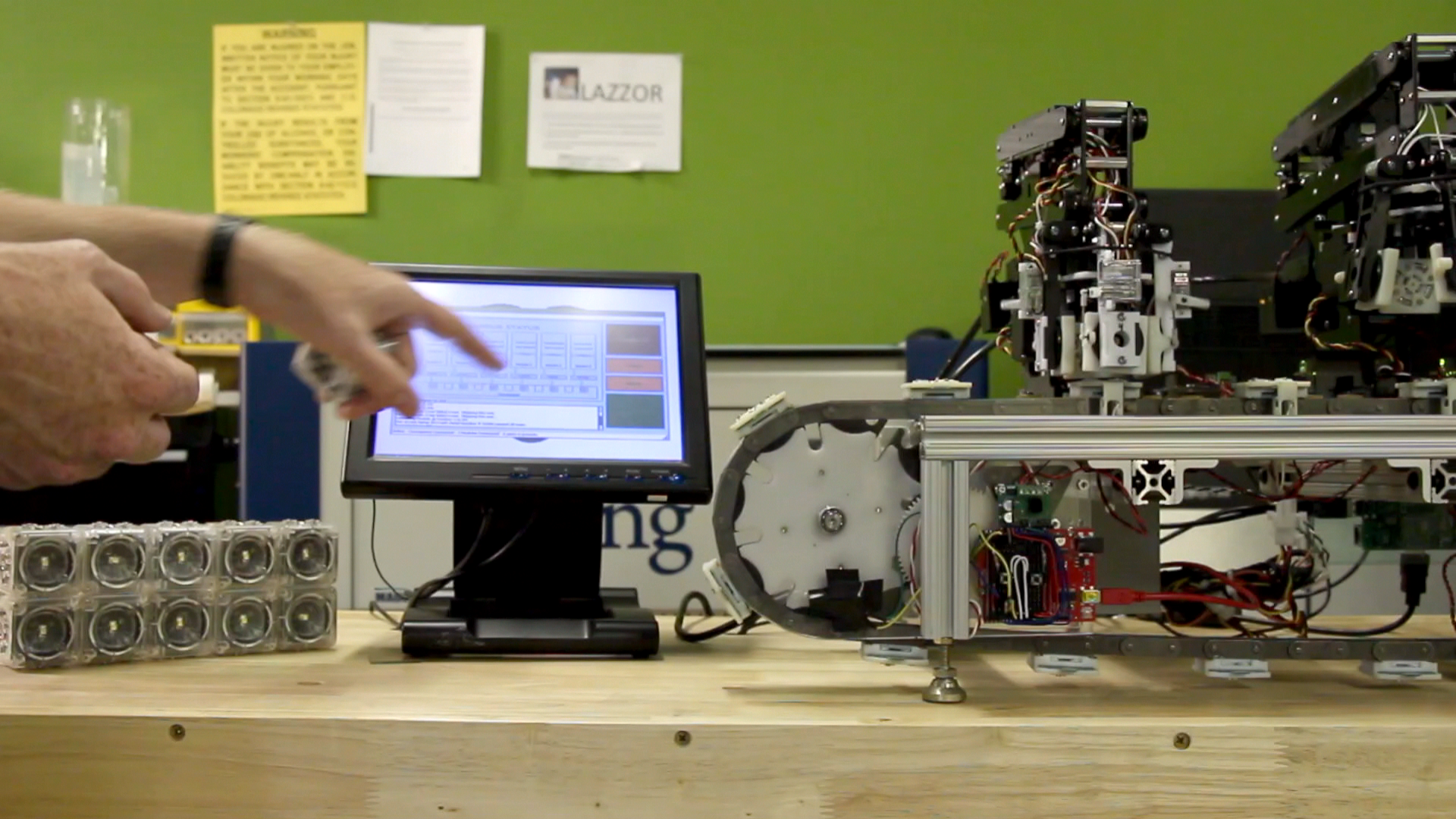
But for the 2nd crousel, we'll only need to process 22,991 PCBs.








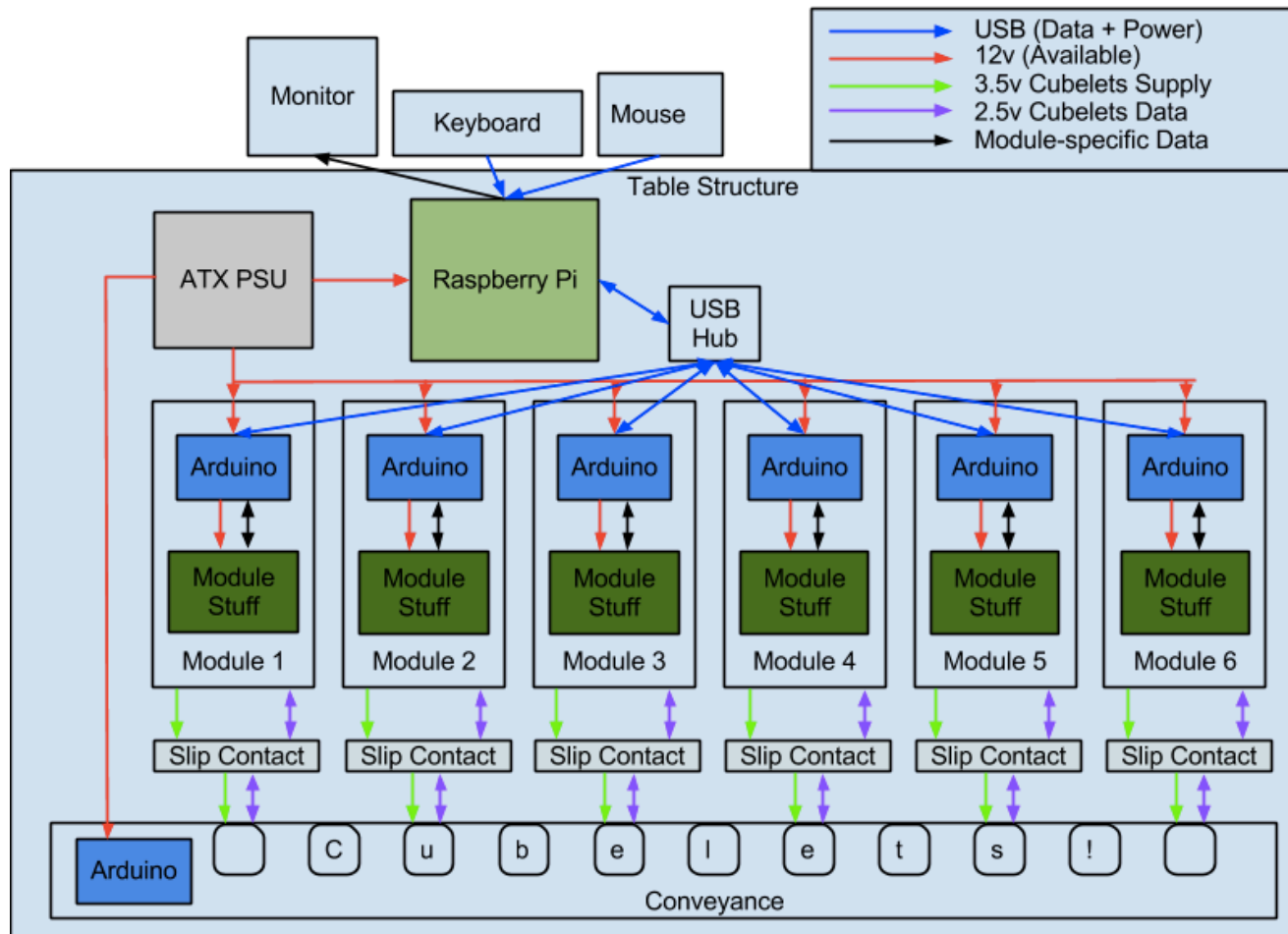




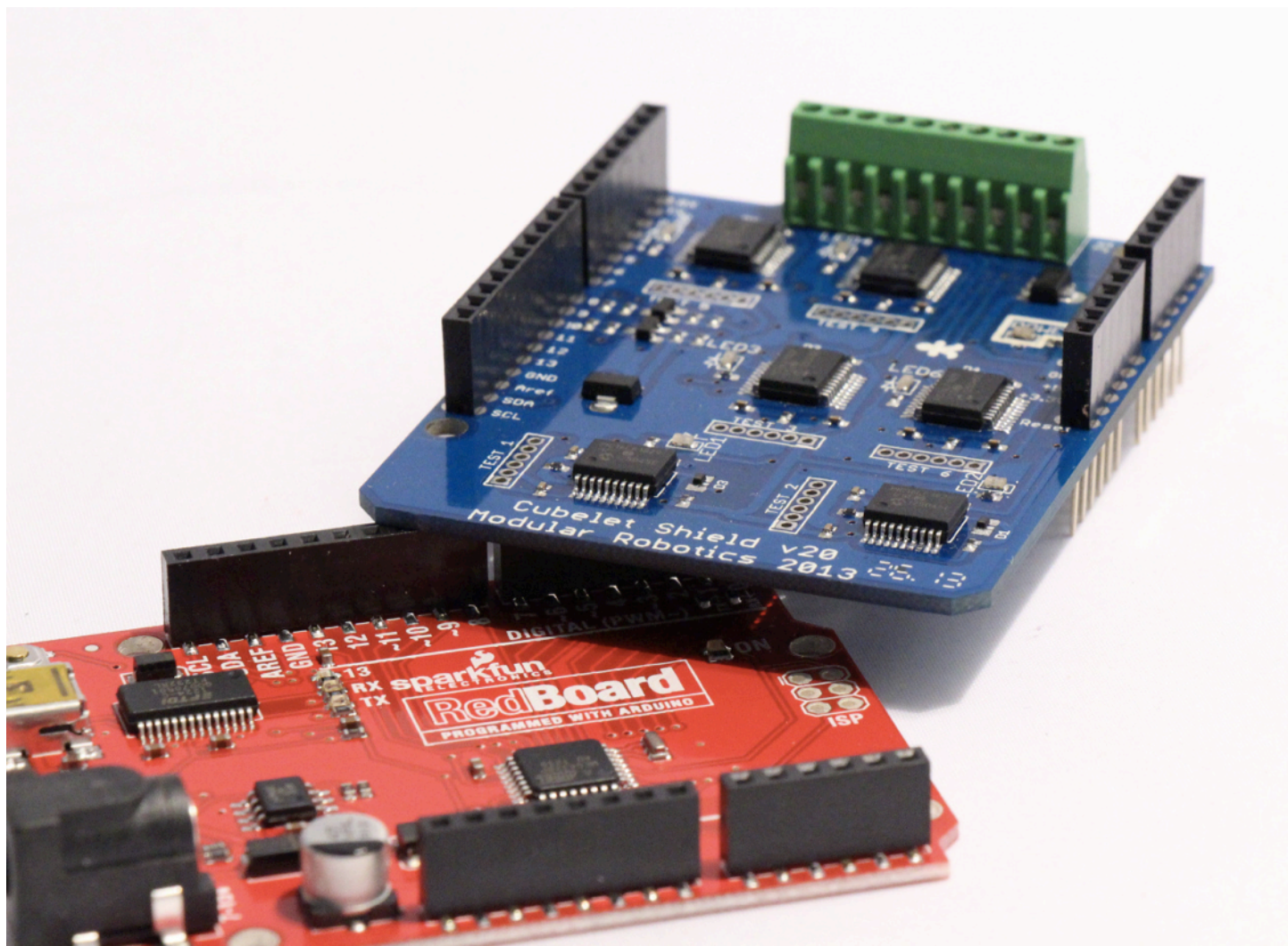
WARNING
A TOOL HAS BEEN USED ON THE
MOUNTING SURFACE OF THIS BOARD.
DO NOT ATTEMPT TO REMOVE THE BOARD
UNTIL THE SURFACE HAS BEEN
REPAIRED. FAILURE TO DO SO
MAY CAUSE DAMAGE TO THE BOARD.
REPAIR THE SURFACE WITH THE
APPROPRIATE MATERIALS.
IF THE BOARD IS DAMAGED, IT
MAY NOT BE USED. CONTACT THE
SUPPORT DEPARTMENT FOR
REPAIR INFORMATION. THE
SUPPORT DEPARTMENT MAY BE
CONTACTED BY PHONE OR BY
EMAIL. VISIT THE WEBSITE FOR
ADDITIONAL INFORMATION.

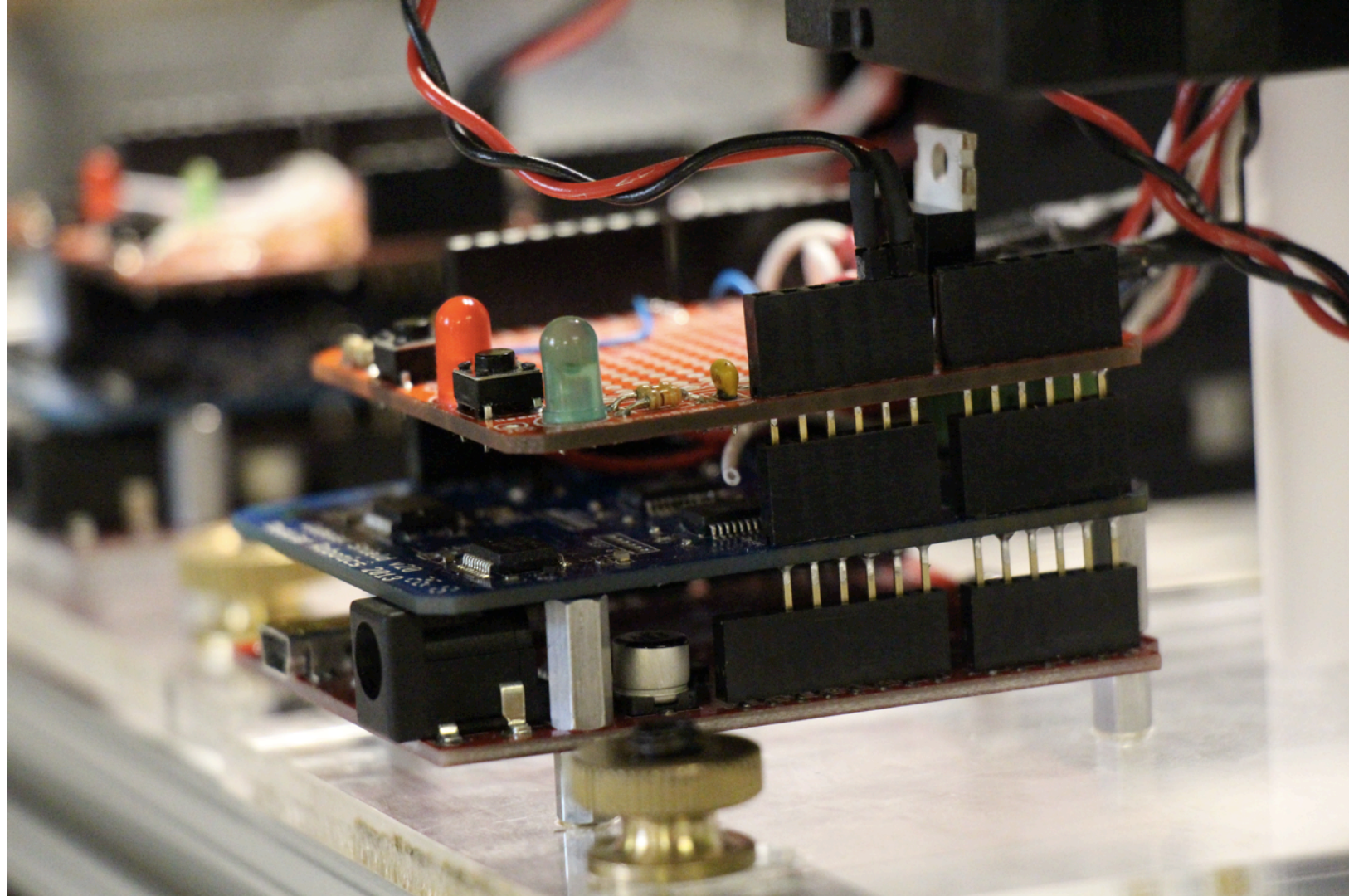
 **LAZZOR**
...
...
...

ng



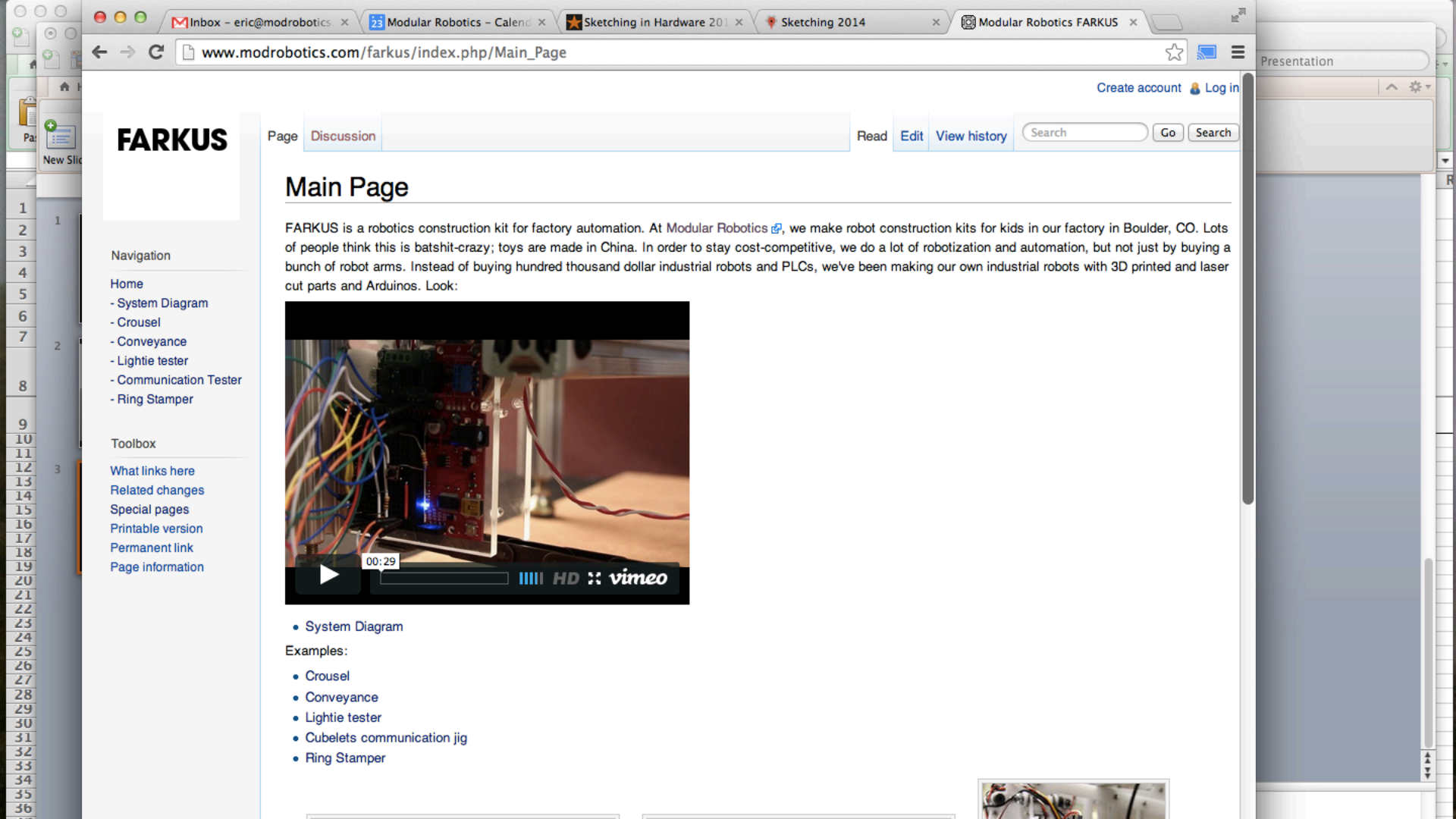








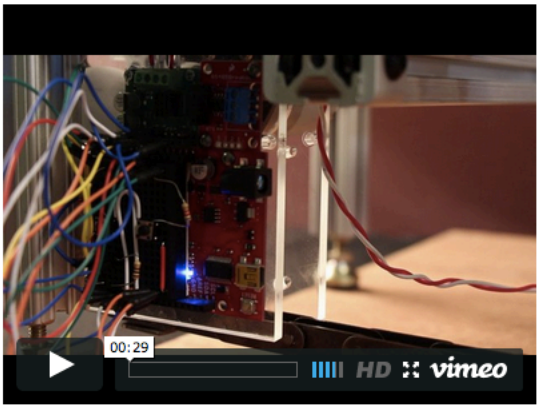
**open source
hardware**



FARKUS

Main Page

FARKUS is a robotics construction kit for factory automation. At Modular Robotics [we](#), we make robot construction kits for kids in our factory in Boulder, CO. Lots of people think this is batshit-crazy; toys are made in China. In order to stay cost-competitive, we do a lot of robotization and automation, but not just by buying a bunch of robot arms. Instead of buying hundred thousand dollar industrial robots and PLCs, we've been making our own industrial robots with 3D printed and laser cut parts and Arduinos. Look:



- System Diagram
- Examples:
- Crousel
 - Conveyance
 - Lightie tester
 - Cubelets communication jig
 - Ring Stamer





MailChimp

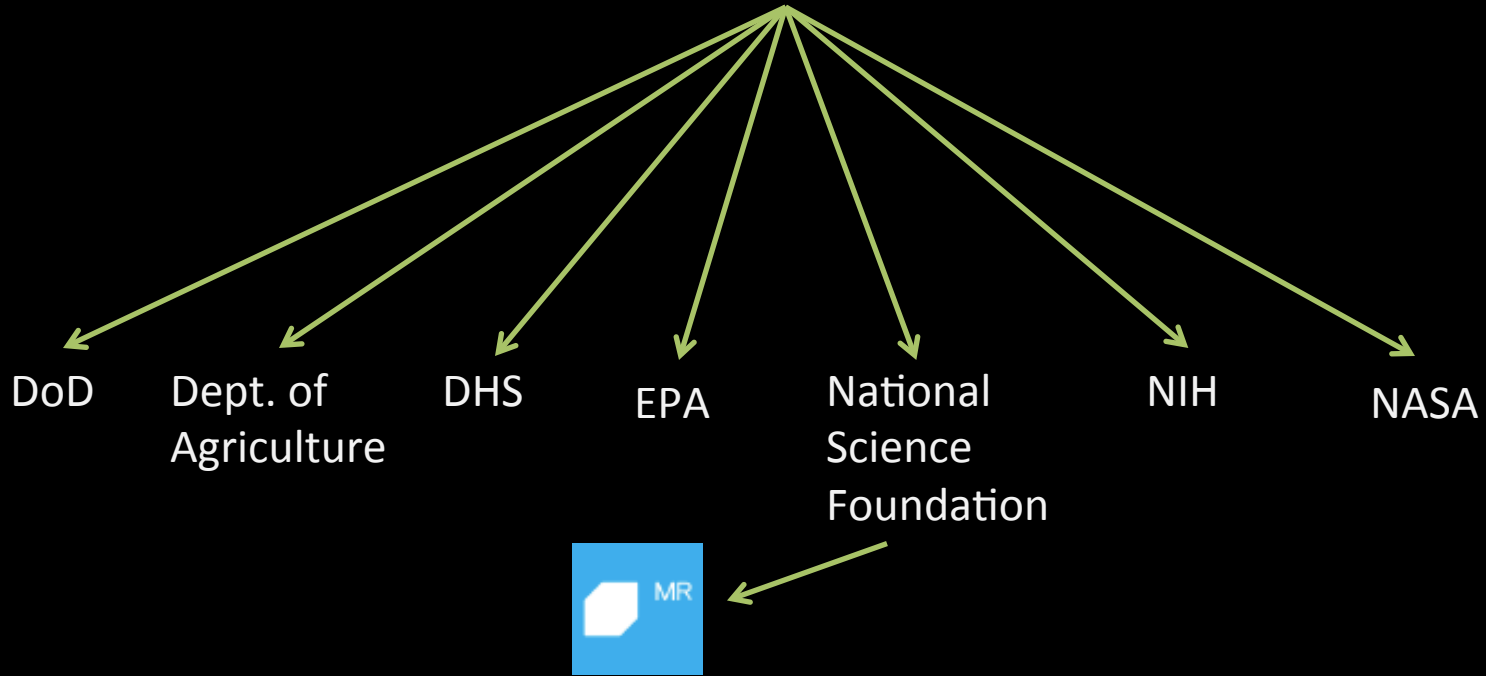


S B I R

SBA

Small Business Administration

SBA



Thank you, National Science Foundation!

(and thank you, taxpayer.)



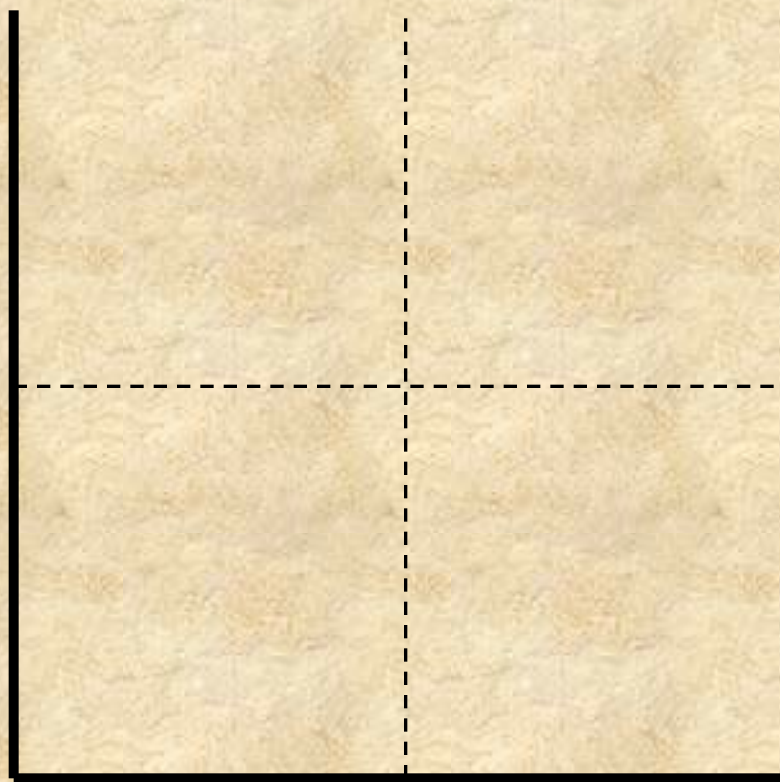
Even if the odds sound really poor, all of the other applications might suck.

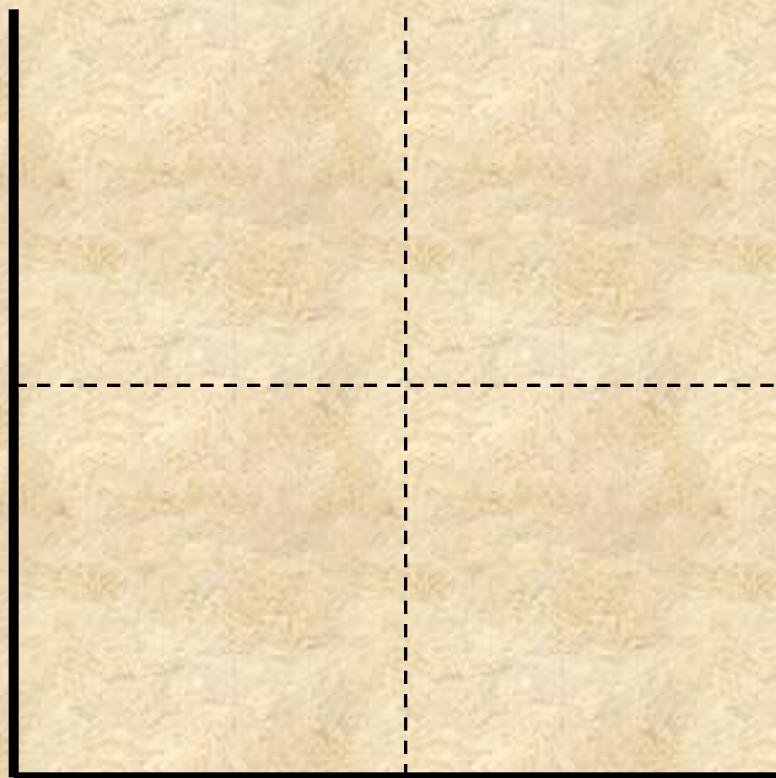
Apply for the grant.



2







Things I'm
bad at

Things I'm
good at

Things I
like doing

Things I don't
like doing

Things I'm
bad at

Things I'm
good at





***Please don't
hate me.***





Thanks!

eric@modrobotics.com

