

SEMI-AUTONOMOUS ROBOTIC ARM

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- ▶ Autonomy
- ▶ Where are we headed?

BACKGROUND INFORMATION



- ▶ Design and Construct an arm
- ▶ Give it the following capabilities:
 - ▶ Recognize certain objects
 - ▶ Ability to translate to the object
 - ▶ Ability to pick up and relocate the object
- ▶ Why?

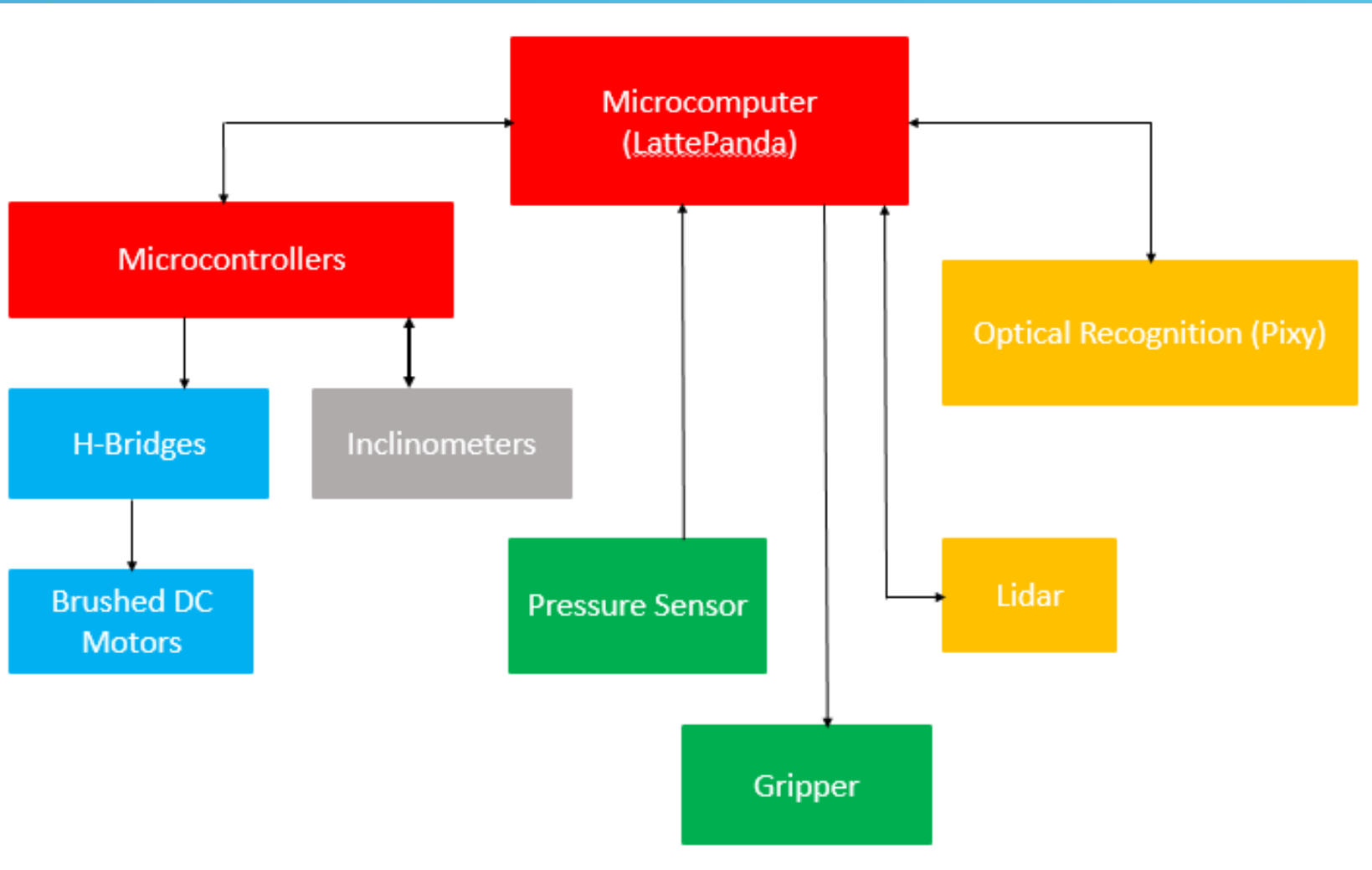
PURPOSE



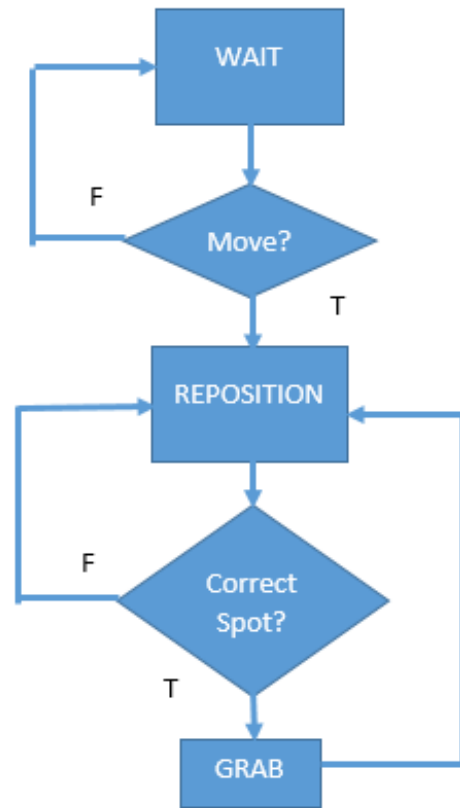
- ▶ Basics
- ▶ Object detection
- ▶ Arm control scheme
 - ▶ Inclinometer – What it does
 - ▶ Closed loop
- ▶ Gripper
 - ▶ Piezoelectric resistive pressure sensor

TECHNICAL DESCRIPTION

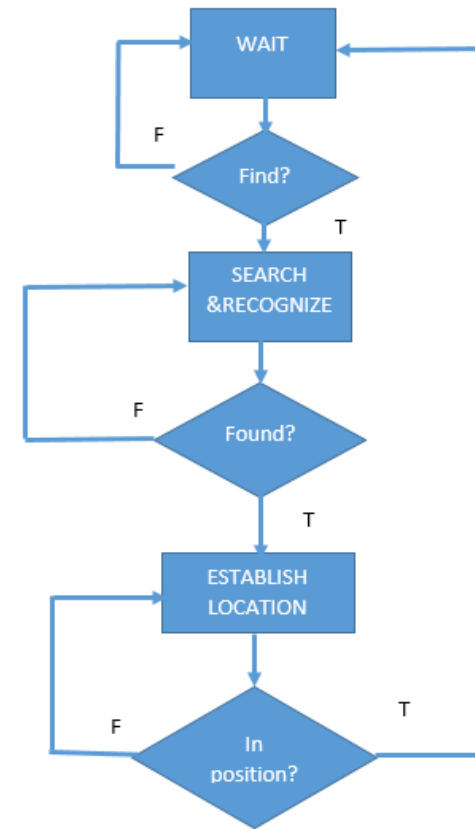




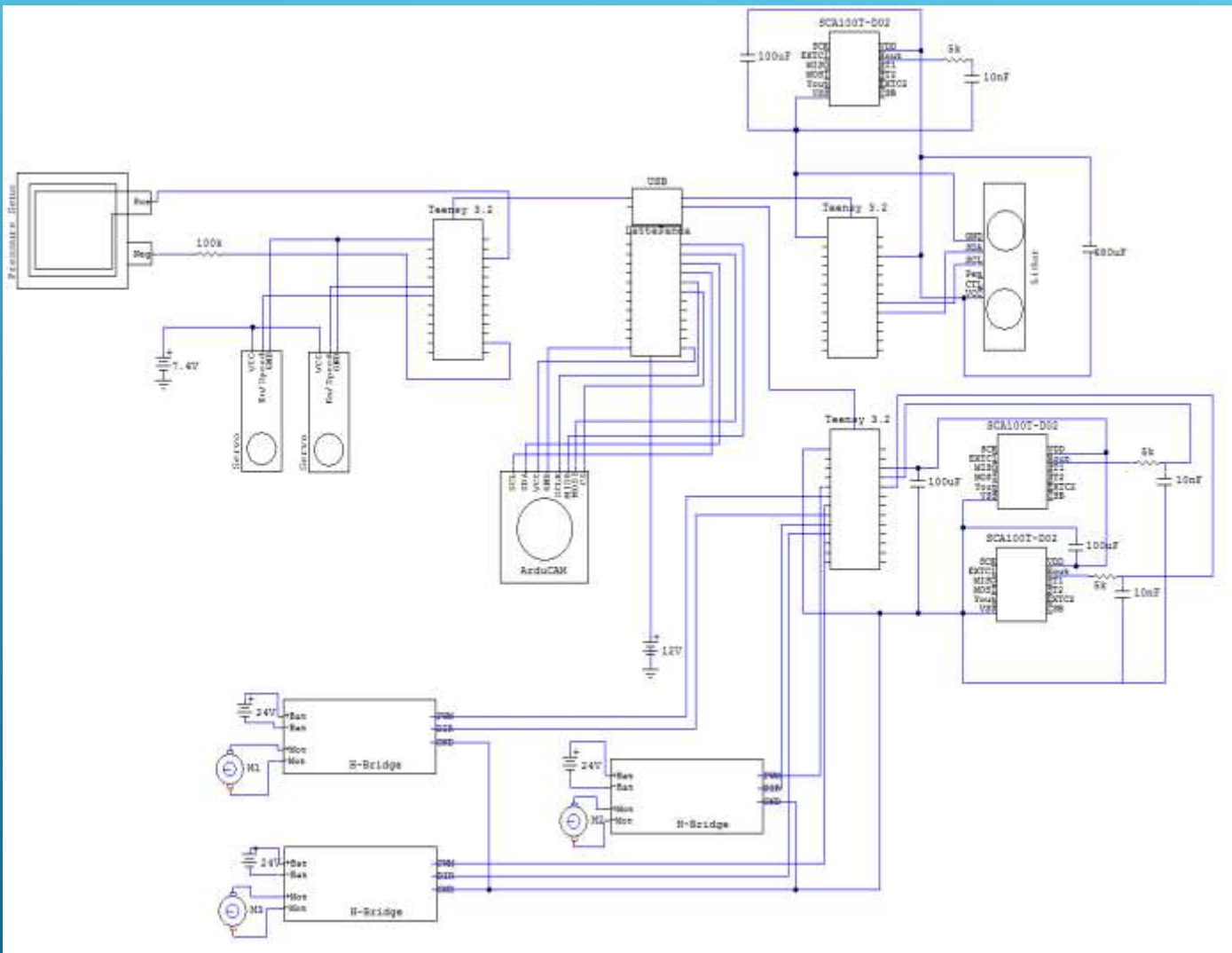
Arm and Gripper Operation:



Camera Operation:



ARTS

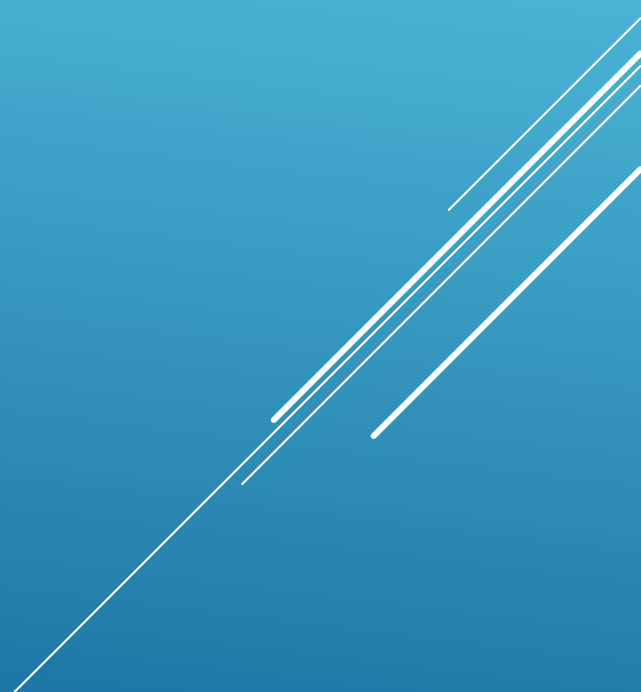




PROTOTYPING AND TEST

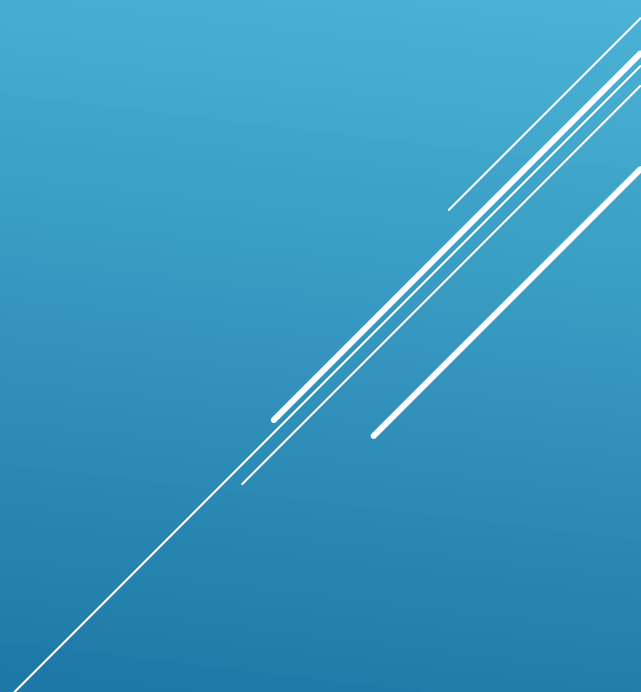


RESULTS





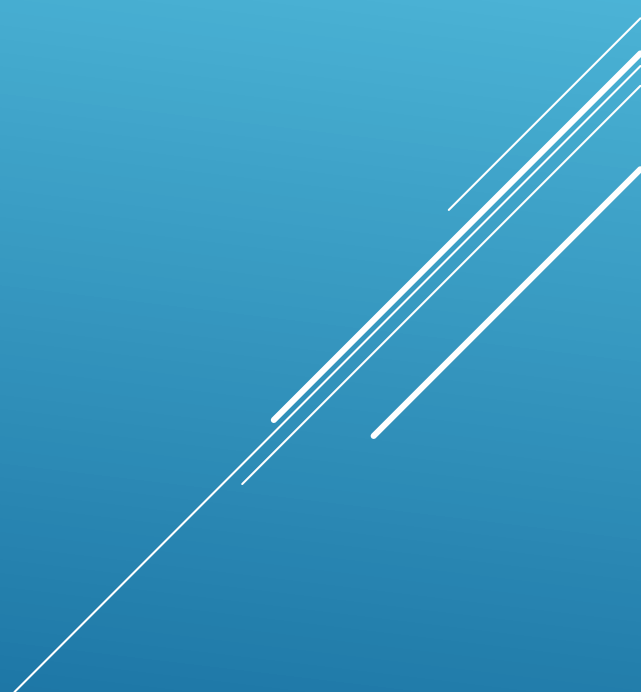
MORE RESULTS



Item	Quantity	Unit Cost (\$)	Shipping Cost (\$)	Brief Description	Total Cost
Motor 1 & 2	2	120	\$24.33	The motors for the base and second segment of the arm	\$288.66
Motor 3	1	\$40.00	\$0	The motor for the third segment	\$40.00
2 Amp Fuse	5	\$1.28	\$0.00	Motor Protection	\$6.40
3 Amp Fuse	2	\$1.97	\$0.00	Motor Protection	\$3.94
5 Amp Fuse	5	\$0.94	\$0.00	Motor Protection	\$4.70
Fuse Holders	10	\$0.70	\$0.00	Inline fuse holder	\$7.00
H-Bridges	3	\$12.85	\$9.00	Controller for our motors which will allow forward/reverse motion and other features as well.	\$47.55
NiMH Battery Pack: 24V 5Ah	2	\$132.95	30	The batteries for the first and second motors	\$295.90
NiMH Battery Pack: 24V 4200mAh	1	\$96.95	\$18.10	The batteries for the third motor	\$115.05
Custom NiMH Battery: 9.6 V 4000 mAh		\$67.65	\$24.95	Battery for LattePanda	\$24.95
Lidar	1	\$149.59	\$0.00	Laser range finder	\$149.59
LattePanda 4G/64 GB Microcomputer	1	\$149.00	\$0.00	Microcomputer - top level control	\$149.00
Heatsink with fan for LattePanda	1	\$21.06	\$0.00	Cooling for microcomputer	\$21.06
SCA 100T-D02 Tilt sensor chip	3	\$48.00	\$0.00	Tilt angle sensors	\$144.00
Rotary Encoder	1	\$24.99	\$2.60	Keep track of rotation angle	\$27.59
Hitec 7954 Servo	1	\$80.90	\$0.00	Gripper close/rotate up and down	\$80.90
Microcontroller	3	\$14.99	\$0.00	Control peripherals	\$44.97
				Total:	\$1,451.26

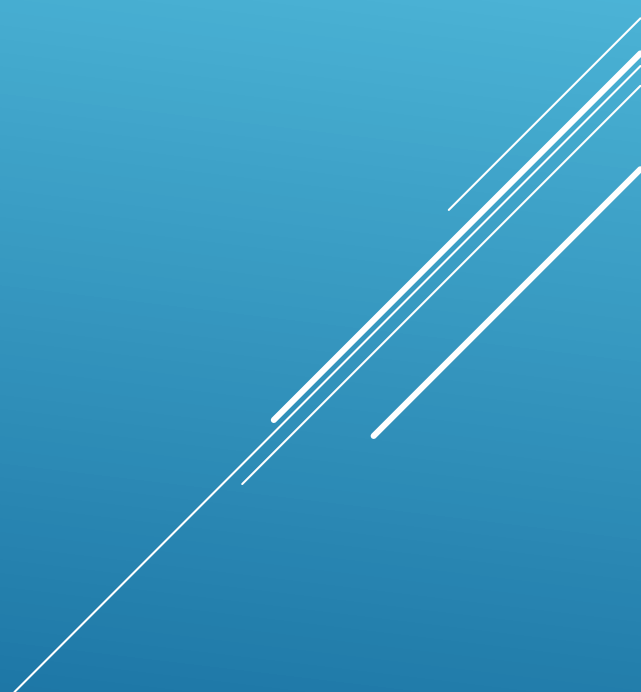
- ▶ Cost
- ▶ Safety
- ▶ Aesthetics

OTHER CONSIDERATIONS



- ▶ A lot of setbacks
- ▶ Major goals accomplished
- ▶ What if we had the other segments?
- ▶ I would...

CONCLUSIONS AND LESSONS LEARNED



- ▶ Mount on chassis
- ▶ Rotatable base → 3-D capabilities
- ▶ Different types of grippers/attachments

LOOKING TO THE FUTURE

A decorative graphic consisting of several parallel white lines of varying lengths, slanted upwards from left to right, located in the bottom right corner of the slide.

Thanks!

