Robotics requirements

Image collection Hardware:

The most straightforward and simple to implement option is using an old iPhone. I have one already and have it working as an IP camera. Currently, the robot will just stream the feed to my desktop and all processing is performed on the desktop. Very easy to use and for the initial sake of the project and the camera quality is good!

Image Processing Hardware:

This project will require two different neural network processing methods. First being the object detection, this will require to be as close to real time as possible. The next will be the operation being performed on the object: for the wandering artist, style transfer would be performed, but other applications could easily be interchanged, such as super resolution.

1. Using <https://github.com/tensorflow/examples/tree/master/lite/examples/object_detection/ios>

It would be possible to compute all object detection “locally” on the iphone used for it’s camera.

1. Could also compute all object detection stuff on desktop via network communication (wifi shield)

System Computing Hardware:

The system must be able to compute its actions locally via a microcontroller. Currently the wandering artist is built using an Arduino Uno, however this is a little bit arbitrary, in general any microcontroller will work if we are assuming computation being offloaded to the desktop. Secondly, the microcontroller must be able to communicate with the image collection/processing units. This may be enabled via a wifi shield, the latency of communication will likely be negligible enough to allow for a real time means of communication between the system and desktop.

Sensing Hardware:

Currently the wandering artist is utilizing a Ultrasound sensor to detect objects directly in its line of travel. Considering the system only really has 3 degrees of freedom (X, Y, Yaw) and it does not have intended behaviours that will act with extremely precise navigation, there is no real major need for a huge amount of these sensors. 1-2 ultrasound sensors is more than sufficient for the purpose of this project. Currently only having one sensors is handled by having the camera and UltraSound sensor facing in opposite directions, once the sensor detects an obstruction, it backs up a sufficient amount to allow for a 180 degree rotation, rotates and then utilizes the ultrasound sensor to sense any obstructions behind it as it backs up and attempts to capture the detected obstruction.

Actuation and Locomotion:

The system is currently actuated by two wheels, effected by two mini DC motors. The rear is simply a nut and bolt that allows for a single point of contact in the back. The stability and rollability in the back is sub-optimal for most environments. It must be very smooth in order to move properly. This system could benefit from two more wheels and potentially more powerful motors. In addition to the Arduino microcontroller, a motor driver is required for the two DC motors.

\*\*\*The robot currently has a very poor method of performing 180 degree turns. It simply just turns for a set amount of time.

Two alternatives:

1. Rotation encoder for the wheel so we can precisely measure the amount the wheel is actually turning
   1. One potential downside is that depending on the surface, the system itself may actually gain a variable amount of rotation. I.e. tires may slip out
2. Compass module along with Arduino’s turn() method to perform turns based on compass
   1. One potential downside is that magnets can throw off the compass module

Body:

The Breadboard, microcontroller, wheels/motors and all other components are all held together using a sparkfun baseplate. Could buy a chassis on amazon or even potentially 3d print one, public library offers 3d printing services.

There seems to be many different “kits” that contains all the components to build a system which is similar to what has been described above.

* <https://www.wish.com/product/5d71b17d83db9a134ba7eb88?from_ad=goog_shopping&_display_country_code=CA&_force_currency_code=CAD&pid=googleadwords_int&c=%7BcampaignId%7D&ad_cid=5d71b17d83db9a134ba7eb88&ad_cc=CA&ad_curr=CAD&ad_price=41.00&campaign_id=8708108847&retargeting=true&gclid=Cj0KCQjw7ZL6BRCmARIsAH6XFDJ1bZ2wTvKpDpObSEh7KZlp0kpbFgTIztuE94drl6p6nRHRFq_pM8EaAl4VEALw_wcB&hide_login_modal=true&share=web>
* <https://www.amazon.ca/perseids-Chassis-Encoder-Battery-Arduino/dp/B07DNXBFQN/ref=asc_df_B07DNXBFQN/?tag=googleshopc0c-20&linkCode=df0&hvadid=292967530290&hvpos=&hvnetw=g&hvrand=8410171639988632129&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1002106&hvtargid=pla-524161075323&psc=1>
* <https://www.wish.com/product/5ddca3b60ea1c406accb6f44?hide_login_modal=true&from_ad=goog_shopping&_display_country_code=CA&_force_currency_code=CAD&pid=googleadwords_int&c=10888013214&ad_cid=5ddca3b60ea1c406accb6f44&ad_cc=CA&ad_lang=EN&ad_curr=CAD&ad_price=39.00&campaign_id=10888013214&retargeting=true&gclid=Cj0KCQjw7ZL6BRCmARIsAH6XFDLWG52jPEi-Pbx8eJ-PdcLmPdzbvoLiCzNS7yHKXF9RFntLRcKzGYgaAvOKEALw_wcB&share=web>

if did not go for iphone option:

wifi+camera: <https://www.amazon.ca/KeeYees-ESP32-CAM-Bluetooth-Dual-core-Development/dp/B07WT9P841/ref=sr_1_11?dchild=1&gclid=Cj0KCQjw7ZL6BRCmARIsAH6XFDJSw8kLv7NQgO2Up4hQZ5fsZ6BY1WeLLYmxG0OSo46t5Obn6ufm-OEaApV2EALw_wcB&hvadid=208392758538&hvdev=c&hvlocphy=1002106&hvnetw=g&hvqmt=e&hvrand=9681829101834315935&hvtargid=kwd-298157573701&hydadcr=1506_9454480&keywords=arduino+wifi+shield&qid=1598364047&sr=8-11&tag=googcana-20>

wifi shields:

* <https://www.amazon.ca/8541608398-Sparkfun-Wifi-Shield-Esp8266/dp/B0130K4H5A/ref=sr_1_11?dchild=1&gclid=Cj0KCQjw7ZL6BRCmARIsAH6XFDJSw8kLv7NQgO2Up4hQZ5fsZ6BY1WeLLYmxG0OSo46t5Obn6ufm-OEaApV2EALw_wcB&hvadid=208392758538&hvdev=c&hvlocphy=1002106&hvnetw=g&hvqmt=e&hvrand=9681829101834315935&hvtargid=kwd-298157573701&hydadcr=1506_9454480&keywords=arduino+wifi+shield&qid=1598364262&sr=8-11&tag=googcana-20>

very cheap Arduino based microcontroller with wifi built in: <https://www.amazon.ca/Development-Arduino-Esp8266-Esp-12E-Peformance/dp/B07WVRW821/ref=sr_1_12?dchild=1&keywords=arduino+uno+wifi+shield&qid=1598364391&sr=8-12>