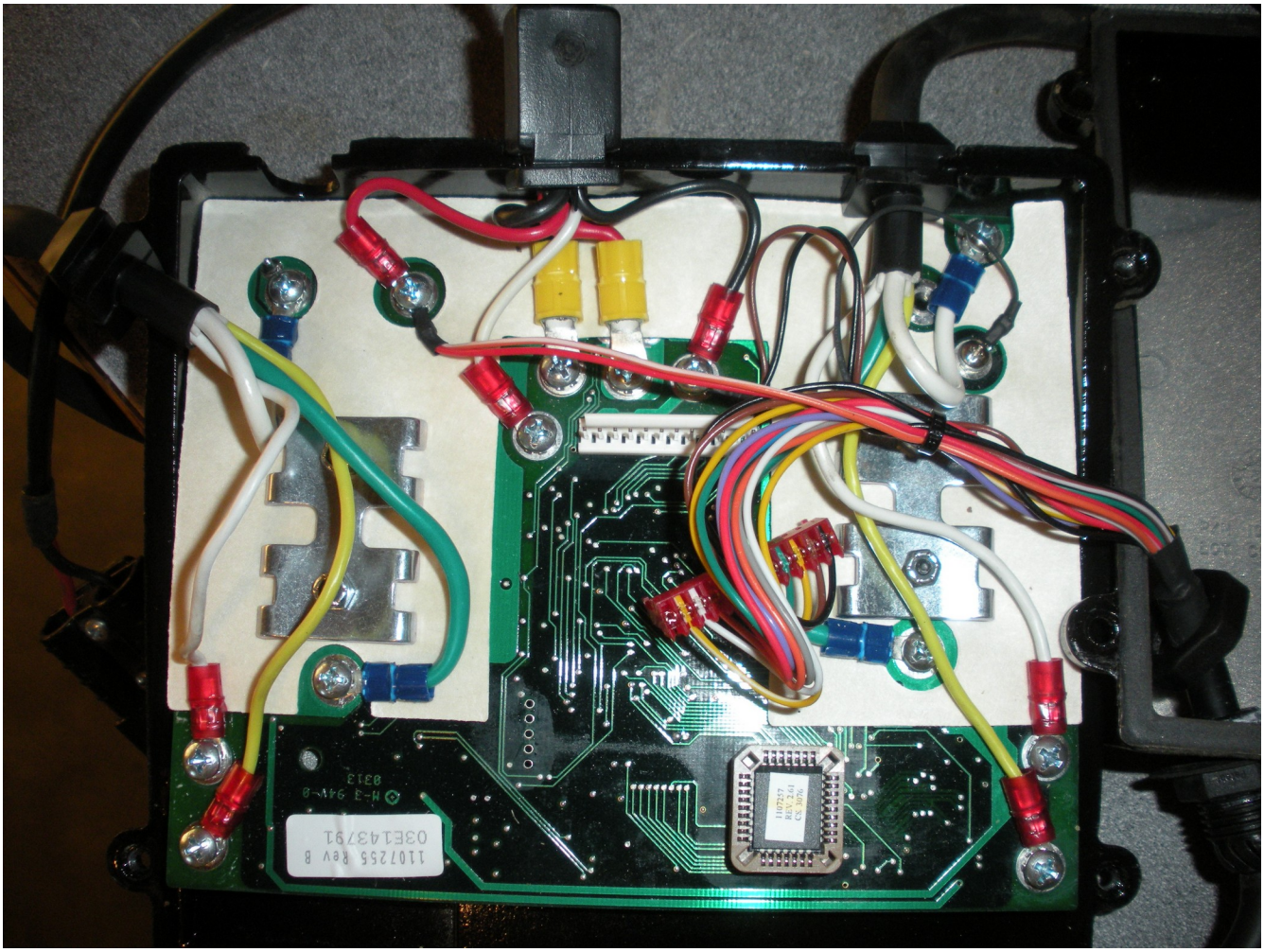
Donkey...just a field robot.
This will be personal copy....a release copy will be edited for reading and eliminated personal items.



Original wheel chair controller above.

====wheel chair notes start ==========

Notes on wheel chair rover.

Wed 30 Oct 2019 10:35:08 AM PDT

I will add notes as I find them or create them.

Realsense cameras D435 and T265 have been on for about a week.

Decided to get a better wifi router for the house. Purchase Netgear NightHawk.
Bit of a bear to set up but range is better.

Tried rover outside with new tiller wheels; was able to climb hill from driveway

to backyard. Tiller wheels are smaller then regular wheel chair tires so stabilizer wheels cause tiller tires to loose traction.

Netgear router started to loose camera signal was it router or
Intel m.2 wifi on Jetson Nano??

When coming back down hill Nano powered off; believe it was regenerative brackin may have surged power; if so might want to consider large cap on buck converter.

Also tipped forward on it's nose coming down hill; need to reinstall stabilizers in front but smaller then original.(Original was 6" wheels might try 4")

Want to install a "follow-me" routine using the D435

Sun 03 Nov 2019 05:18:09 AM PST

Items changed and weirdness noted.

installed aluminum angle bar for switches and wifi antennas.
each jetson nano has buck converter on a switch, they are susceptable to surging. Both units need to be turned simultaneous or one will surge the other off.
believe the regenerative braking sometimes causes surging, shutting off nanos

Sat 01 Feb 2020 02:07:27 PM -08

set NetGear router on south deck wall outside

ssh -X 10.0.0.4 from zt desktop
test Donkey with D435 camera, Donkey got to grape vines at top of hill ....did not push further will try further later

will redesign base for 4 wheel or 6 wheel drive
design will be 4 wheel with optional space in middle
for the extra drive wheel

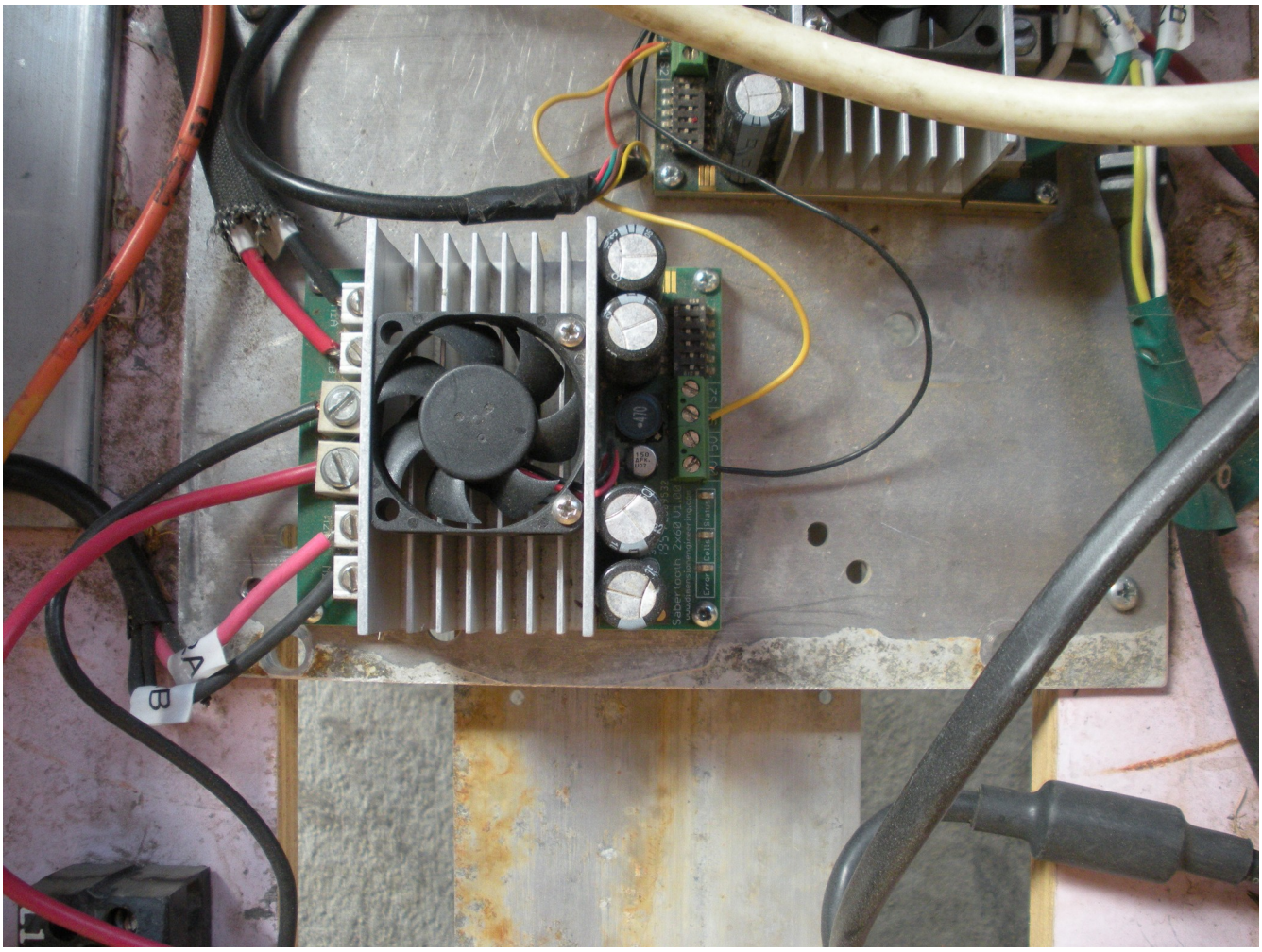
**Sat 08 Feb 2020 08:10:25 AM -08
I will start pushing the updates from top down

The Jetson Nano does not work in cold weather below freezing....will be looking to get a TX series they go for about
400(TX1) and 500(TX2) will keep Nanos for inside work.

Another area I am looking at is operating system... Ardupilot seems to have real good potential... as does ROS
will have to look at potentials and learning curves

Started out as an Invacare wheelchair....400 lb. capacity ....removed brakes... replaced 2 Gel batteries (12volt each x2 = 24)....kept charger which still works....removed controller

Motor controller is a Sabertooth 2x60 from Dimension engineering....good support....helped me thru some error light issues....and some serial coding issues



Controller is Jetson Nano with a second Nano as backup....Jetson Nano has very good specs but will not function below freezing.... there is a industrial version of the module that goes from -20C to +80C approx $165... the carrier board runs between 0C to 30C.... not good

Have added 3 vl53l1x TOF devices from STM....these are use for collision avoidance....they work fairly well inside....they are used on Arduino Uno and sometimes hang up which might be cause from the additional cable length attached to them

GNSS will be with ublox Zed-f9p module device....

Fri 14 Feb 2020 09:48:02 AM -08

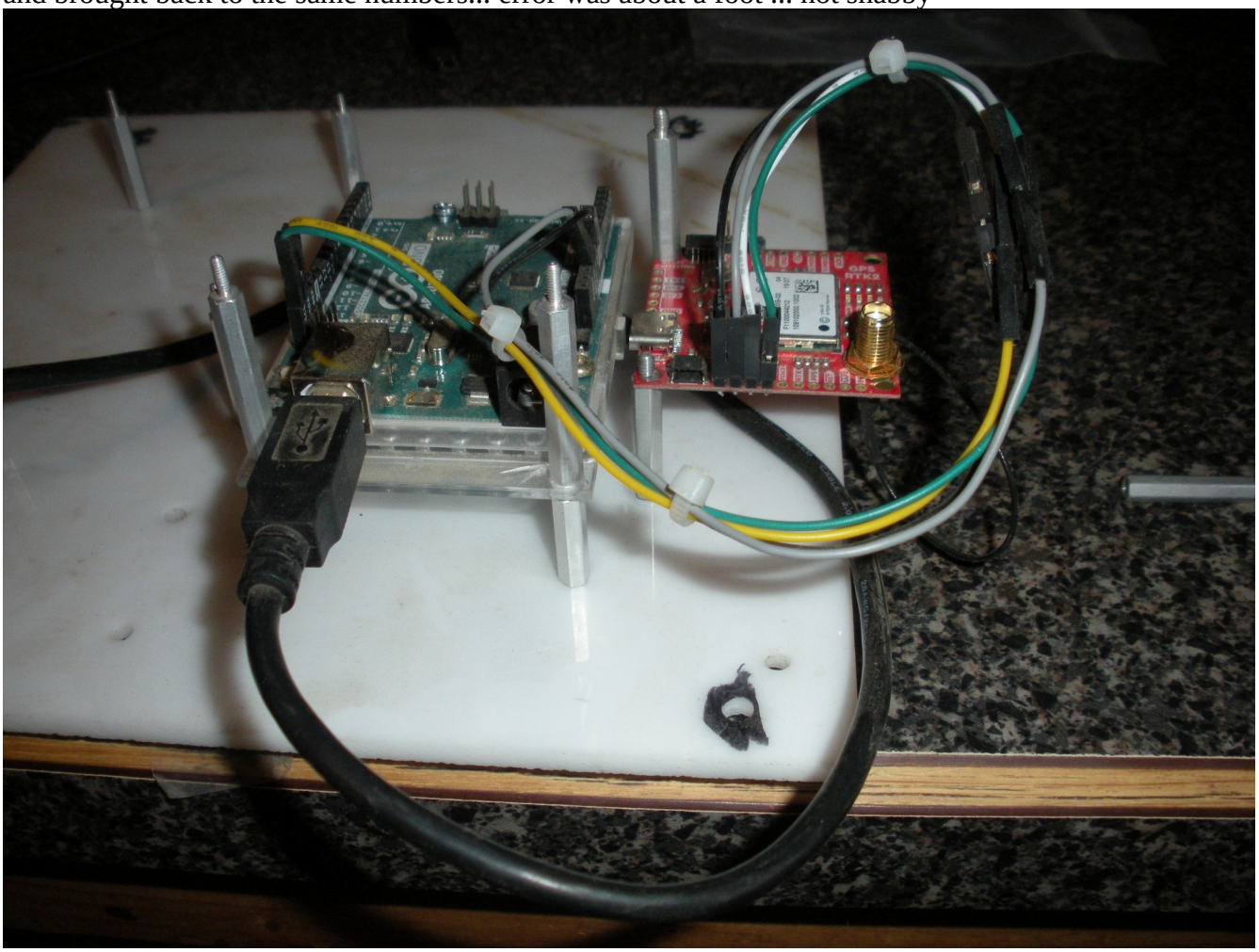
Am considering ROS so that I can implement GNSS/GPS RTK location control to the

mix. May aslo be useful other areas of control. Learning curve may be a problem...
old dog new trick syndrome:)

I have a folder "agriculture_ros" copied to seagate drive with start up code.

Sat 08 Feb 2020 04:37:27 PM -08

Installed Sparkfun ZED-f9p onto Donkey to see how accurate the gps was
with-out RTK base correction the last 5 numbers were 37459(lon) and
52181(lat) last two numbers were changing... took the Donkey off location
and brought back to the same numbers... error was about a foot ... not shabby



Will try again with multiple locations and need to write code that will
allow Donkey to move from GPS loc to another GPS loc

Mon 24 Feb 2020 06:59:37 PM -08

Built a program called "gpsloca" which receives gps data thru the ZED-f9p running on arduino code

the code sends out a serial signal on /dev/ttyACMx right now the code is working with Arduino Leonardo but it also works with Arduino Uno or STM32 f401RE (this device may need to be reset which may make it undependable) the Donkey has a wifi range limitations... to the cat litter pile

Thu 27 Feb 2020 07:31:35 PM -08

Was trying to push 4 usbs .. two cameras T265 D435 and two arduinos (Uno and Leonardo) with one Jetson Nano... Nano would shut down. Installed Triplet 4 way USB hub with external 5 volt and tethered it to Nano; with 2 cameras and two arduinos Nano stayed on

With gpsloca and afield2 both running the motor control only took commands from the first one turned on.

Will start working on GPS map and control via gpsloca or develop another program

Sat 21 Mar 2020 08:26:04 AM -08

Purchased a Sparkfun Red Board(treated like Arduino Uno) and 3-Axis digital compass from Digi-Key and incooperated into afield2 running under folder afield2a. This gives me 4 serial port devices running from the Tripplite USB hub. They code had to be revised to handle vendor_id, product_id and new one "description". Need to find a way to mount to get most accurate direction.

Wed 25 Mar 2020 06:19:52 AM -08

Worked on in-cooperating a " follow_bearing_motor_control" function into the mix. Added another check box to include the function when checked. The function is similar to "forward_motor_control" function with the addition of compass bearing/heading adjustment. Need to tweak it for 359/0 bearing. Have already tweak the Arduino code to change BMM150 update delay from 100 milliseconds to 300 milliseconds; this seems to smooth things a little.
Also added a spinbox that changes the divisor in the correction steering code (1-9). A divisor of 1 is quicker but jerkier movement while 9 is slower but smoother corrections.

May have mentioned before, if not I have made a decision too in-cooperate second set of wheels and motors for true 4 wheel drive and better traction; after all this is robot for the hilly outside vineyard.

Sat 04 Apr 2020 06:30:44 AM -08

This is a GET list that I want.

** Two more Invacare M91 motors and tiller wheels with hubs.

Right motor gear box Huafeng part# DG-109A2 Model# 1110642 part# 1086228
Right motor motor Huafeng part# ZYT-420B Model# 1110642 part# 1114306 RPM cw138 ccw136

Left motor gear box Huafeng part# DG-109A2 Model# 1110643 part# 1086227
Left motor motor Huafeng part# ZYT-420B Model# 1110643 part# 1114307 RPM cw137 ccw136

** A second Dimension Engineering 2x60 motor drive controller.

* RC controller and receiver for field control.

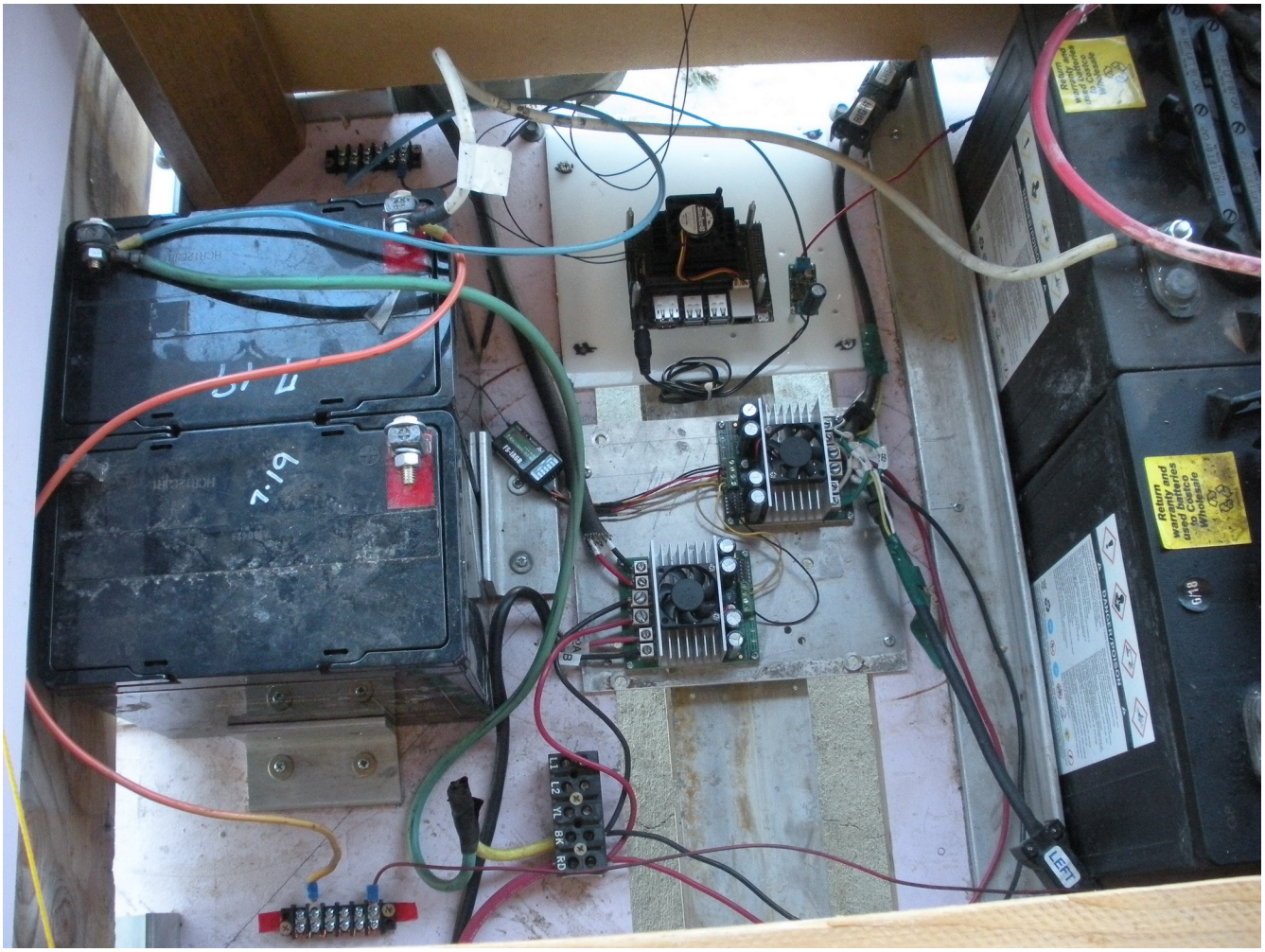
==========
Sun 14 Jun 2020 12:11:28 PM PDT

Ordered two wheel chair motors similar to the original motors; cost was around $250.

Once the motors arrived they were tested and verified. Ordered two wheels and hubs for said motors and RC controller from Superdroid which cost around $265.

Ordered second 2x60 controller from Dimension engineering about $200.


GOLF
GOLF



Order Versalogic Tetra from Digikey $580 industrial embedded Linux board.

Ran two motor controllers with single RC controller. Melted 12 guage wire on battery hook up wires. Went to minimum of 6 guage wiring on batteries to controllers...then 12 guage to controllers and motors.
12 volt source is two slow...24 volt is too fast and controllers hiccup...
18 volt for now seems adequate and functional

Will work with Jetson Nano again to eliminate RC controller

Thu 02 Jul 2020 07:19:57 AM PDT

Have installed GPS again on the 4 wheel drive Donkey.
I can steer around the driveway "tear" using the camera with reservations.
Need to come up with algorithm that uses GPS, TOF or Lidar, radar and camera for guidance. Maybe a study of drone avoidance system will work. Also need to come up with auto stop if lost of wifi connection...don't want Donkey to self destruct.

Mon 06 Jul 2020 07:32:00 AM PDT

Need to pay attention to battery charger hook up, yesterday I dragged one around the drive! Think I will go back to 24 volt set up for recharging purposes.

Need to find outside wifi router, lost signal to Donkey at top of Himrod grape's rows.

Thinking of building narrower Donkey or shrinking this one.

Sat 01 Aug 2020 07:05:24 PM PDT

I have been running some test runs with the Donkey. The loop starts on south west side of basement...pivot to the west drive down the lawn hill stop in the drive ....pivot to the south and head around the tear....drive between the truck and tractor and head for the basement wall where I started.

Yesterday I was going to fast and got too close to the tractor catching driver side front wheel of the Donkey causing a spinning halt...no damage lucky... (this does mean I need to persue obstacle avoidance measures.)

Today I lost the control of the Jetson Nano and the Donkey kept driving...had to rush out hit the power switch...I installed the timeout feature in the Sabertooth 2x60 and tested

it, worked! ... as I get further away from the house it will be necessary for sure

These pictures are of the original donkey that I lost control of.

Sat 08 Aug 2020 09:31:42 AM PDT

Have installed the WiFi range extender (TP Link AC1200) on the house roof; it has improved the range of the Donkey but still falls short of full coverage of the property.

Donkey roadtest 10 went to east property line, need new camera and maybe a better position on Donkey chassis, got stuck need to raise frame, communication failed before reaching high point of back line, frame width needs to be reduced.

Donkeyroad test 11 went to vineyard to bottom of babies; where it seem to lose communications. Did finally move and came up the hill fairly well. Will look for stronger Wifi extender and a better USB camera.

Mon 31 Aug 2020 09:22:09 AM PDT

THERE ISN'T ANYTHING EASY ABOUT EMBEDDED COMPUTERS!!

The following is the starting point for setting up eMMC on Jetson Nano
production board I hope. The first go round may not work!
I will add revisions as needed.

Setting up a new SD card I have to use the SD card in the Jetson Nano
I have to jumper Forced Recovery pins. Jumper the pins for power in using barrel jack.

Use the ZT computer. USB2 jack A from ZT to USB mini B on Jetson Nano.
The SDK manager from Nvidia is installed, hopefully it will work.
The Jetson OS is also built for the Nano.
I installed with wifi card installed.
After successfully installing the system, disconnect the Forced Recovery.

Thu 03 Sep 2020 07:50:29 PM PDT
Seems I have to run the flashing twice but it finally worked.
Sudo apt update and sudo apt upgrade.
Then I can start installing apts and such.Thu 03 Sep 2020 07:50:09 PM PDT

I installed Qtcreator and Synaptic after that.
Make sure to get the libqt5serialport files.

The afield2 code is on the 16G stick...folder afield2a_org.
After compiling make sure you add user to dialout...
sudo adduser andy dialout

Fri 04 Sep 2020 10:29:54 AM PDT

This is the date where I make notes concerning the eMMC production board.
After installing the system and Qt and synaptic (see above) I opened
afield2_org project in Qt and compiled it. The bin file is afield2 which
was copied to /usr/local/bin/. I also installed

gst-launch-1.0 -v v4l2src device=/dev/video0 ! image/jpeg, width=640, height=480, framerate=30/1 !
jpegparse ! jpegdec ! videoconvert ! videoscale ! xvimagesink sync=false

to terminal. Made some changes and final sketch was

gst-launch-1.0 -v v4l2src device=/dev/video0 ! image/jpeg, width=320, height=240, framerate=15/1 !
jpegparse ! jpegdec ! videoconvert ! videoscale ! xvimagesink sync=false

using in terminal:
ssh -X andy@donkey-emmc.local

I called up:

gst-launch-1.0 -v v4l2src device=/dev/video0 ! image/jpeg, width=320, height=240, framerate=15/1 ! jpegparse ! jpegdec ! videoconvert ! videoscale ! xvimagesink sync=false

gst-launch-1.0 -v v4l2src device=/dev/video0 ! image/jpeg, width=320, height=240, framrate=10/1 ! jpegdec ! videoconvert ! videoscale ! ximagesink sync = false

This brought up the Logitech USB web cam

using a second terminal:
 ssh -X andy@donkey-emmc.local

I called up:
afield2

I was able to run the donkey around the back yard until I lost signal strength over by the walnut tree. Note this wifi module only has one antenna I will install second one on other side of donkey. On the return to the donkey's dock it took a big bump but stayed on line

Fri 11 Sep 2020 09:16:35 AM PDT

This AM recorded emmc_road_test5 went to driveway between crab apple and walnut then upped the speed to 52(out of 127). Drove to junction of drive and field paths turned uphill and drove to vineyard path crest. Pivot back to house and drove to backup spur of drive way; increased pivot speed to 60(max) did two spins to port and two spins to starboard. The camera hiccuped once or twice but the donkey kept moving, this indicates to me that the emmc module has shock capabilities. After the spin test I drove donkey to back yard to where the Kabota bucket is setting turned around headed back to house. Went past house and down hill to driveway and then to front yard drove back to it's parking zone and parked.

Starting to think about a directional wifi antenna on roof to track the donkey's gps position and hopefully increase donkey's range. Another scenario is two get a second TP-Link that might increase coverage area.

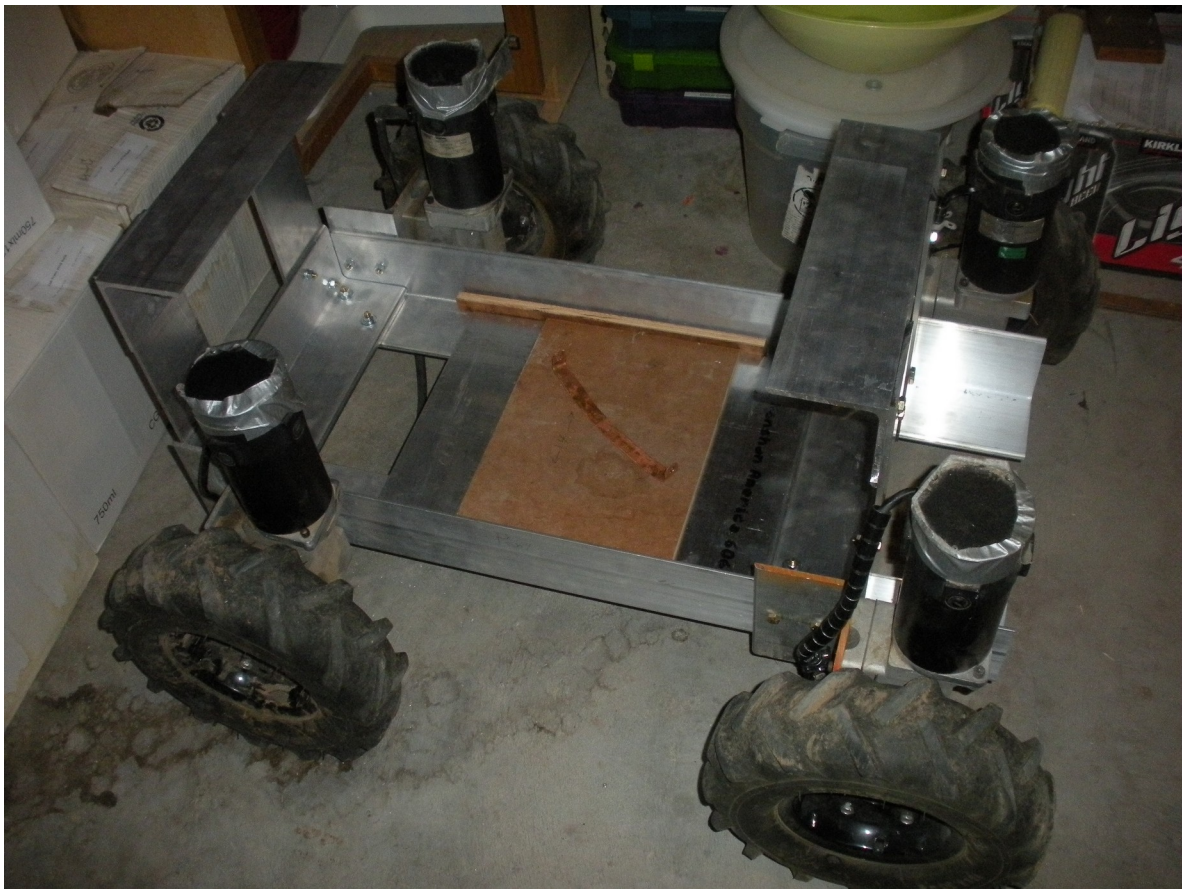
Ordered second ZED F9P to create a base and rover GPS system with RTK.

Tue 29 Sep 2020 06:56:39 AM PDT

From 11 Sep to present worked on new Donkey chassis made of aluminum. Will include pictures in folder


KIRKLAND
Light


Light




7-19
7-19

Dimensions:

Chassis length 36"
Wheel base length 39"
Wheel base width 33" .....barely goes through 36" doorway
Chassis height to lid 22.5" .....the height will go higher with devices such as GPS, cameras, Lidars, robot arms

Have run the NewDonkey inside at slow speed and was able to go thru door way it is tight. Notice front and rear wheels pivot at different speeds, I will try to write some software that will allow for rear or front only pivots. Will also write software for dedicated to GPS, I have ordered a third ZED F9P module. I will dedicate one to a base station and the others will be on the Donkey for orientation and bearing and speed,etc.

Sat 03 Oct 2020 03:03:51 PM PDT

Want to mention right away that when programming in Qt on Jetson Nano emmc module it has some quirks.
Make sure to add CONFIG += c++11 to the .pro file in your program. If at compilation it just files off and doesn't seem to compile I go into the .pro file and comment out " TARGET app" and save.
If it does it again I uncomment the same "// TARGET app". If I make a change to the UI I will remove the build-xxxx folder of the program I'm working on and let it rebuild a new one.

Now on to Donkey stuff. I rebuilt afieldx to afield3. Afield3 has check boxes so that I can pivot just one set of wheels front or rear or both. This helps in tight situations like when coming through door ways and parking to the curb:)) I have incooperated Forward and Reverse, also I have Left and Right for
turning while in motion. I have an adjustable divisor at present trying to figure at what speed the is good for.

Sat 10 Oct 2020 05:21:19 AM PDT

Yesterday I tried to pull sprayer with 180 lbs of sand up to the back yard; the donkey had enough power but insufficient traction. All 4 wheels were spinning. Couple of options:
1) Add a power drive to the sprayer

Pro: Can use existing sprayer with modification

Con: Modification design maybe complicated

2) Make an add on sprayer to the donkey chassis

Pro: Foot print is smaller

3) Make another sprayer but smaller

Tue 13 Oct 2020 01:41:23 PM PDT

Today I installed two gps modules and antennas on the donkey. The antennae are located on the hinged door on a 44" long 1" x 2.5" piece of oak. The oak is centered on the top hinged door. The antennas are oriented the same and centered 1 meter apart sitting on 6 inch metal ground planes. One antenna feeds a C099 F9P module from ublox, the other antenna feeds a GPS-15136 from Sparkfun. While prototyping I will interface with Arduino Uno and Red board. Configuration is the same on both boards. Eventually hope to GPS precision to 1 centimeter. Need to develop software to give me heading information

Mon 19 Oct 2020 12:40:52 PM PDT

Still working on GPS accuracy and update speed. Everyone of the ZED F9P modules had a different firmware version. The Sparkfun was FW ver. 1.11 and I upgraded it to 1.13. The receiver C099 was FW version 1.12 and I upgraded it to ver. 1.13. The base was V1.13 and it had been upgraded a few days ago. I set all the modules to default and ran them outdoors. The accuracy improved but it seemed to take awhile to settle down. I will try to set the rate to 5Hz and see if that improves the settling time.

Mon 26 Oct 2020 05:51:38 PM PDT

Built up a program ubxg..ubx gui.. it has the back antenna set up as a moving base it sends RTCM3 signals to the rover which is hard wire to the base's tx2 via it's rx2. It does detect heading going forward and reverse. If the donkey is headed north it reads around 360 or 0 degrees if going in reverse it reads 180 degrees out of phase with going forward. It shows speed in kmph.. I had the donkey up to 7 kph. It's still rough around the edges but moving in the right direction

Thu 29 Oct 2020 06:44:41 AM PDT

Yesterday...built up new program called adonk combining the afield3 and ubxg programs. One bug I found is that
serial ports go 3-4 cycles before being accepted. I believe it is the ublox device which looks for 2 other USB
devices; I will work on it. The donkey itself shows direction,speed and gps coordinates.

Fri 06 Nov 2020 07:16:19 PM PST

Today I developed and installed some code on the donkey that will allow me to pick and show a single way point.

It allows me to see the direction and distance to the new location. This code involve a lot of trig...anyhow I
will have to keep an open mind to use math with the donkey. I will try to follow the donkey around the tear and
back yard and maybe build a waypoint map. Also I need to build or purchase a motorized gimbal for the Lidar so
that the donkey can feed smooth through outside 36" doors...I renamed this version of adonk -> adonkway <-. It
is built on adonk code sitting in folder adonk_b after the compile I just rename the bin file adonkway.

Sun 08 Nov 2020 06:01:53 PM PST

Cleaned up "adonkway" and called it "adonkey"... Wire suppling 12 to C099 F9P module burnt up some how, have
decided to power it through USB am going to order 24volt to 5 volt regulator to power USB hub so that I can
run more Arduino like devices....still working on GPS

Sun 15 Nov 2020 06:38:25 PM PST

Ordered a pan tilt servo from roboshop that I may hook the Lidar lite v3hp to...or maybe a camera, price total
was just under $80.
Thinking about putting the TOF VL53l1x modules back on the donkey to manuver in and out of doors and
tight places inside. May try to use two break out boards hooked to a single Arduino and call the TOF starboard
and TOF port. May have a program just for inside manuvering and going thru doors. name "donkio"?

Sat 05 Dec 2020 06:48:41 AM PST

Concerning the TOF VL53l1x I have found a way to get one Nucleo board to do three inputs, front , starboard and
port. It works somewhat but still the donkey acts like a bull in a china shop...more work... the wheels defintely
turn at different speeds..the front wheels turn faster then the rear wheels and the starboard front is the fastest
I have noticed donkey drift to port at high speeds...wrote some code to increase port wheel speed at different
speeds

Mon 07 Dec 2020 12:26:09 PM PST

Took donkey out side when temp was freezing or slightly below; the new module and version B of sub carrier board
seemed to work well...this is a step in the right direction...the code I wrote to compensate for donkey fading to
the left seemed to work well and keep donkey straighter...I am a little disappointed with the TOF not helping

with getting thru the doors. Another disappointment is when I hooked up the D435 RS camera the robot failed in
general; putting the webcam back on seemed to make things get back to normal

Fri 11 Dec 2020 07:00:48 PM PST

Install Realsense on emmc module realsense-viewer works directly but not in ssh mode. I need to figure out why
might have to do with how it's compiled and it's configuration and place in memory. On the same note of realsense-viewer
I have a recording on an older jetson nano of realsense-viewer running remotely.

Sun 10 Jan 2021 06:40:56 PM PST

I am seriously thinking of puting the Jetson Nano on top of the Donkey; mounting all the other hardware inside with the
wiring and batteries. This will help with prototyping and up grades. Yesterday I received in the mail a Pixy2 and out of
the box it has problems. I spent a lot time trying to get it to work for not. Am not impressed but I have an email to
support@pixycam.com and the company I bought it from.

====wheel chair notes end ==========