



Uçuş Simülatörü için Joystick Arayüzü

BIL 495
2. İzleme

Şevval MEHDER

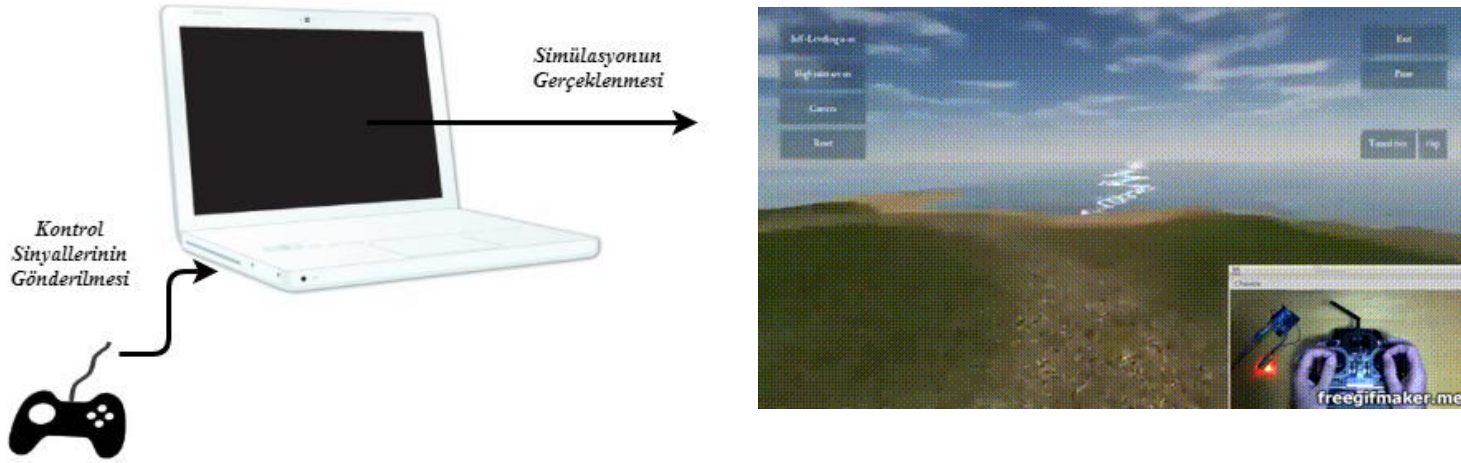
Proje Danışmanı: Prof. Dr. Erkan ZERGEROĞLU
Aralık 2018



- Projenin Şeması ve Tanımı
- Proje Tasarım Planı
- Yapılanlar
- Yapılacaklar
- Kaynaklar



Proje Şeması ve Tanımı



- ArduPilot Simülasyon Programı için bir joystick donanımı ve arayüz hazırlanması.



Raspberry Pi Zero'nun USB aygıtı olarak tanınması desteği sağlandı.

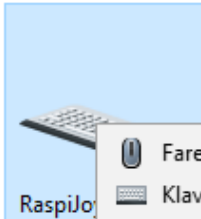
▼ Aygıtlar (4)



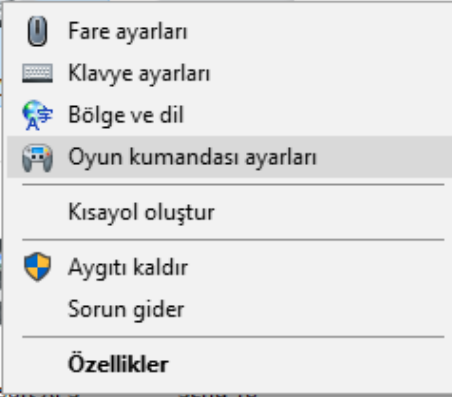
2.4G Mouse



DESKTOP-40S3P
V3



RaspiJoy



▼ Yazıcılar (4)



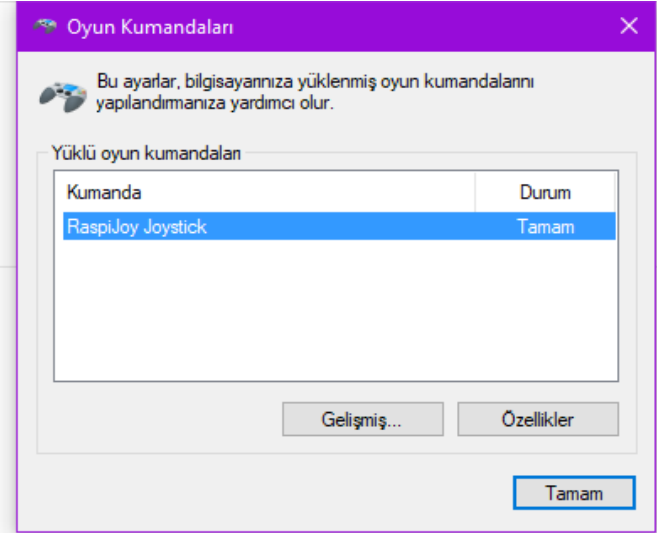
Fax



Microsoft Print



Microsoft Print



Yapılanlar

```
sevval@subuntu:~$ lsusb
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 007: ID 1d6b:0104 Linux Foundation Multifunction Composite Gadget
Bus 001 Device 003: ID 248a:8366
Bus 001 Device 002: ID 0bda:57de Realtek Semiconductor Corp.
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

```
sevval@subuntu: ~
E: Ad=81(I) Atr=05(Isoc) MxPS=2688 Ivl=125us
I: If#= 1 Alt= 7 #EPs= 1 Cls=0e(video) Sub=02 Prot=00 Driver=uvccvideo
E: Ad=81(I) Atr=05(Isoc) MxPS=3072 Ivl=125us

T: Bus=01 Lev=01 Prnt=01 Port=04 Cnt=02 Dev#= 3 Spd=12 MxCh= 0
D: Ver= 1.10 Cls=00(>ifc ) Sub=00 Prot=00 MxPS= 8 #Cfgs= 1
P: Vendor=248a ProdID=8366 Rev= 1.00
S: Manufacturer=Telink
S: Product=2.4G Mouse
C:* #Ifs= 1 Cfg#= 1 Atr=a0 MxPwr= 50mA
I:* If#= 0 Alt= 0 #EPs= 1 Cls=03(HID ) Sub=01 Prot=02 Driver=usbhid
E: Ad=82(I) Atr=03(Int.) MxPS= 8 Ivl=4ms

T: Bus=01 Lev=01 Prnt=01 Port=05 Cnt=03 Dev#= 7 Spd=480 MxCh= 0
D: Ver= 2.00 Cls=00(>ifc ) Sub=00 Prot=00 MxPS=64 #Cfgs= 1
P: Vendor=1d6b ProdID=0104 Rev= 1.00
S: Manufacturer=RaspiJoy
S: Product=Joystick
S: SerialNumber=raspi0123joy
C:* #Ifs= 1 Cfg#= 1 Atr=80 MxPwr=250mA
I:* If#= 0 Alt= 0 #EPs= 2 Cls=03(HID ) Sub=01 Prot=01 Driver=usbhid
E: Ad=81(I) Atr=03(Int.) MxPS= 8 Ivl=1ms
E: Ad=01(O) Atr=03(Int.) MxPS= 8 Ivl=1ms
sevval@subuntu:~$
```



USB konfigürasyon dosyasının yazılması

This is an introduction to the controls.

```
1 // Raspjoy data structure in C looks like
2 struct raspjoy_report_t{
3     uint8_t buttons;
4     int8_t left_x;      // yaw
5     int8_t left_y;      // throttle
6     int8_t right_x;     // roll
7     int8_t right_y;     // pitch
8 }
9
```

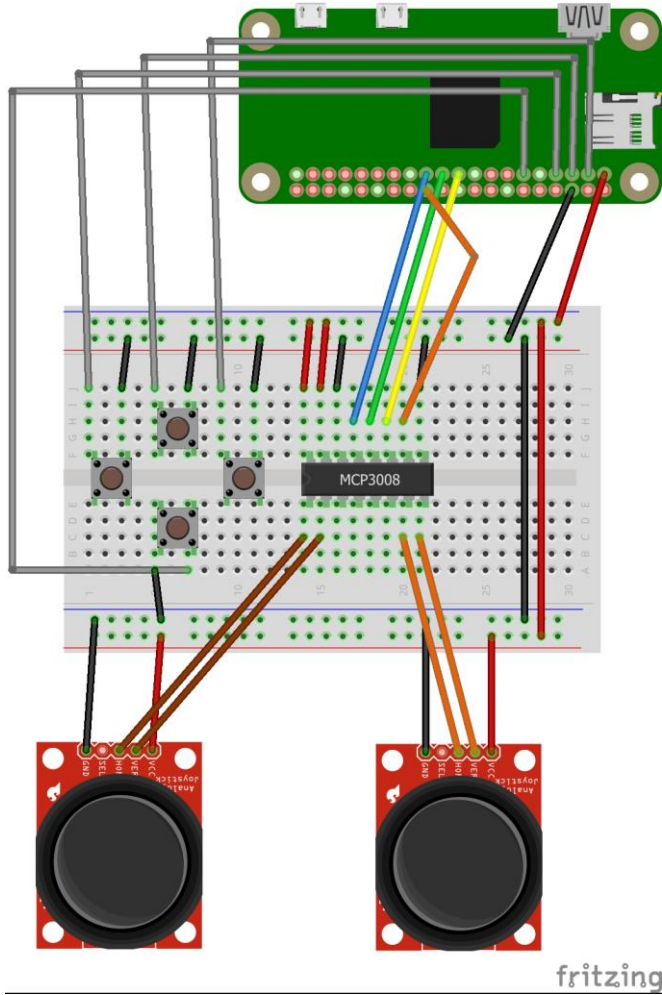


Bilgisayara veri gönderilmesinin sağlanması

```
pi@raspberrypi: ~  
root@raspberrypi:/home/pi#
```

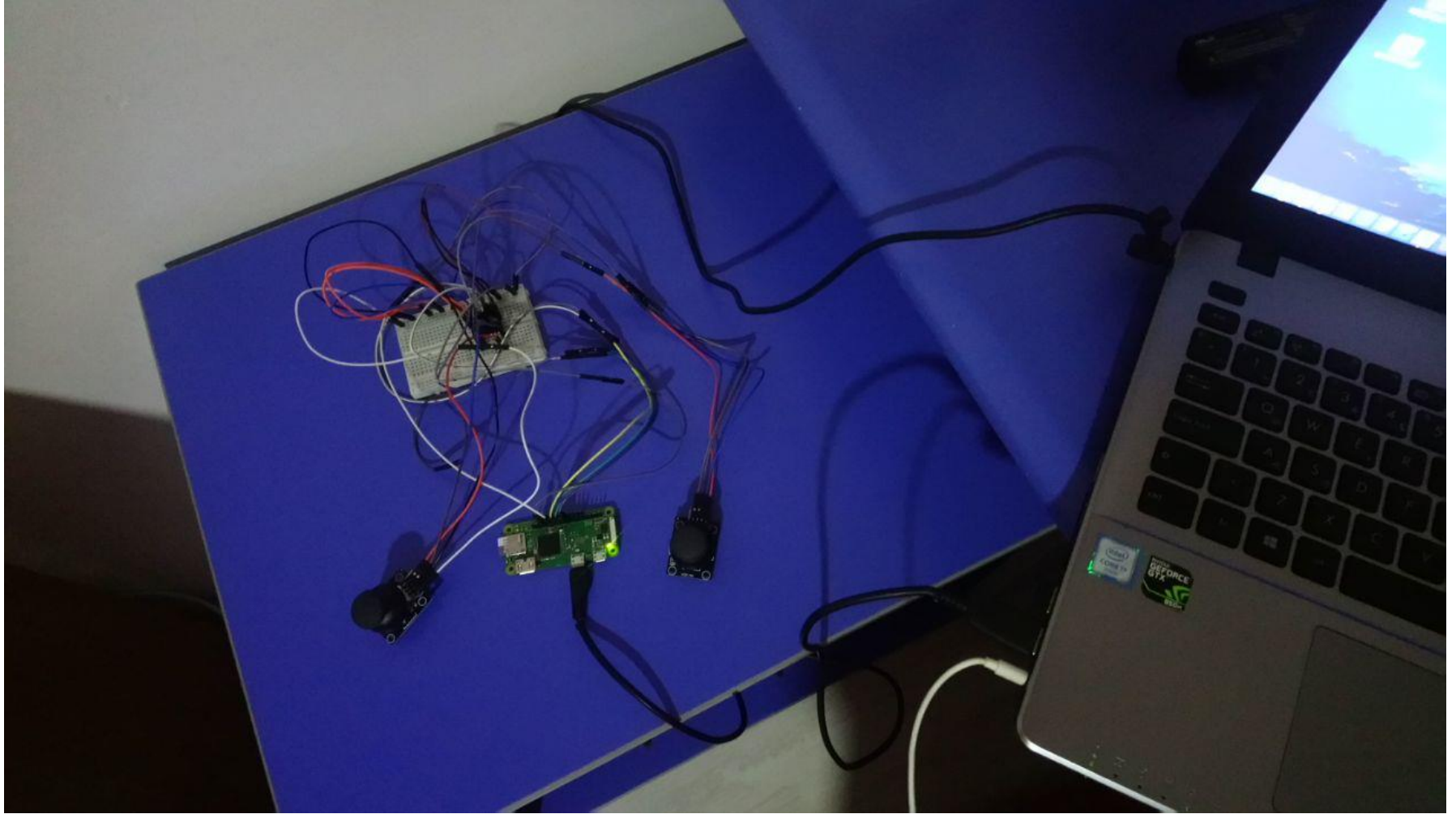
```
sevval@subuntu: ~  
sevval@subuntu:~$ jstest /dev/input/js0  
Driver version is 2.1.0.  
Joystick (RaspJoy Joystick) has 4 axes (X, Y, Z, Rx)  
and 8 buttons (Trigger, ThumbBtn, ThumbBtn2, TopBtn, TopBtn2, PinkieBtn, BaseBtn  
, BaseBtn2).  
Testing ... (interrupt to exit)  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
ff 4:off 5:off 6:off 7:off
```





Analog joystick
modüllerinin
ADC(MCP3008 chip)
yardımıyla Raspberry'e
bağlanması

Yapılanlar



Joystick modüllerinden gelen bilginin bilgisayara gönderilmesi

```
pi@raspberrypi: ~  
root@raspberrypi:/home/pi#
```

```
sevval@ubuntu: ~  
sevval@ubuntu:~$ jstest /dev/input/js0  
Driver version is 2.1.0.  
Joystick (RaspiJoy Joystick) has 4 axes (X, Y, Z, Rx)  
and 8 buttons (Trigger, ThumbBtn, ThumbBtn2, TopBtn, TopBtn2, PinkieBtn, BaseBtn  
, BaseBtn2).  
Testing ... (interrupt to exit)  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 0 1: 0 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 32767 1: -32767 2: 0 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 32767 1: -32767 2: -32767 3: 0 Buttons: 0:off 1:off 2:off 3:off  
Axes: 0: 32767 1: -32767 2: -32767 3: -32767 Buttons: 0:off 1:off 2:off 3:off  
ff 4:off 5:off 6:off 7:off
```



Yapılanlar

```
sevval@ubuntu: ~/Desktop/FinalProject/ardupilot/ArduCopter
Loaded module console
Loaded module map
Log Directory:
Telemetry log: mav.tlog
MAV> Waiting for heartbeat from tcp:127.0.0.1:5760
STABILIZE> Received 942 parameters
Saved 942 parameters to mav.parm

STABILIZE>
STABILIZE> module load joystick
STABILIZE> MAVProxy.modules.mavproxy joystick: Found joystick (OpenChord X RMIT Exertion Games Lab UnoJoy Joystick)
MAVProxy.modules.mavproxy joystick: Failed to find matching joystick.
Loaded module joystick

STABILIZE> joystick probe
STABILIZE> MAVProxy.modules.mavproxy joystick: Re-detecting available joysticks
MAVProxy.modules.mavproxy joystick: Found joystick (OpenChord X RMIT Exertion Games Lab UnoJoy Joystick)
MAVProxy.modules.mavproxy joystick: Failed to find matching joystick.

STABILIZE> joystick status
STABILIZE> No active joystick

STABILIZE>

ArduCopter
Set parameter SIM_SPEEDUP to 1.000000
Creating model + at speed 1.0
Home: -35.363261 149.165235 alt=584.000000m hdg=353.000000
Starting sketch 'ArduCopter'
Starting SITL input
Using Irlock at port : 9005
bind port 5760 for 0
Serial port 0 on TCP port 5760
Waiting for connection ....
Loaded defaults from /home/sevval/Desktop/FinalProject/ardupilot/Tools/autotest/default_params/copter.parm
bind port 5762 for 2
Serial port 2 on TCP port 5762
bind port 5763 for 3
Serial port 3 on TCP port 5763
Smoothing reset at 0.001
Loaded defaults from /home/sevval/Desktop/FinalProject/ardupilot/Tools/autotest/default_params/copter.parm
[]
```

Map

Console

```
STABILIZE ARM GPS: OK6 (10) Vcc 5.00 Radio: - INS MAG AS RNG AHRS EKF LOG F
att: 100%/12.59V 0.0A Link 1 OK 100.0% (15610 pkts, 0 lost, 0.00s delay)
dg 353/0 Alt 0m AGL 0m/0m AirSpeed 0m/s GPSSpeed 0m/s Thr 0 Roll 0 Pitch 0 Wind -/-
P/O Distance 0m Bearing 0 AltError 0H AspdError 0.0H FlightTime-- ETR 0:00

ready to fly fence breach
PM: GPS 1: detected as u-blox at 115200 baud
PM: EKf2 IMU0 initial yaw alignment complete
PM: EKf2 IMU1 initial yaw alignment complete
PM: EKf2 IMU0 tilt alignment complete
PM: EKf2 IMU1 tilt alignment complete
PM: EKf2 IMU0 Origin set to GPS
PM: EKf2 IMU1 Origin set to GPS
PM: EKf2 IMU0 is using GPS
PM: EKf2 IMU1 is using GPS
light battery 100 percent
```



Bilgisayar tarafından tanınan joystick'in MAVProxy yer istasyonu tarafından da tanınmasının sağlanması

```
sevval@subuntu: ~/Desktop/FinalProject/ardupilot/ArduCopter
27.0.0.1:5501" "--out" "127.0.0.1:14550" "--out" "127.0.0.1:14551" "--
map" "--console"
RtTW: Starting ArduCopter : /home/sevval/Desktop/FinalProject/ardupilo
t/build/sitl/bin/arducopter -S -I0 --home -35.363261,149.165230,584,35
3 --model + --speedup 1 --defaults /home/sevval/Desktop/FinalProject/a
rdupilot/Tools/autotest/default_params/copter.parm
Connect tcp:127.0.0.1:5760 source_system=255
Loaded module console
Loaded module map
Log Directory:
Telemetry log: mav.tlog
Waiting for heartbeat from tcp:127.0.0.1:5760
MAV> STABILIZE> Received 942 parameters
Saved 942 parameters to mav.parm

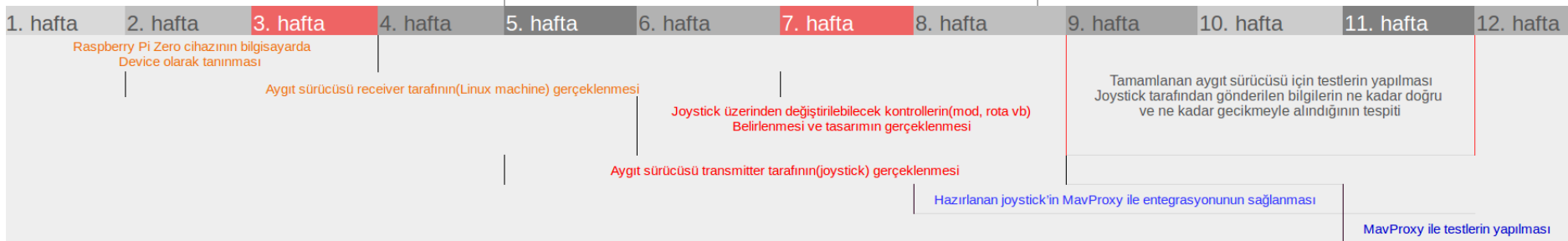
STABILIZE>
STABILIZE> module load joystick
STABILIZE> MAVProxy.modules.mavproxy_joystick: Found joystick (RaspiJo
y Joystick)
MAVProxy.modules.mavproxy_joystick: Using /usr/local/lib/python2.7/dis
t-packages/MAVProxy/modules/mavproxy_joystick/joysticks/raspijoy.yml (
"RaspiJoy Joystick" matches pattern "RaspiJoy Joystick")
Loaded module joystick
```



Yapılacaklar

- Doğru joystick bilgilerinin alınması
- Gecikme değerlerinin ölçülmesi
- Simülasyonda doğru sinyallerin doğru hareketi gerçekleştirmesinin sağlanması

Başlangıç Tarihi: 22.10.2018



1. Joystickle uçuş demosu ve detaylı bilgi:

<https://myfirstdrone.com/how-to-fly-a-quadcopter>

