WonavCT - Position Mapping System

A system which can be used in GIS applications by capturing images of areas and recognize objects with high precision of location.

Last update: 2021-06-28 13:24:32

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Archived Project

1. Overview

This product consists of 3 components:

A rover

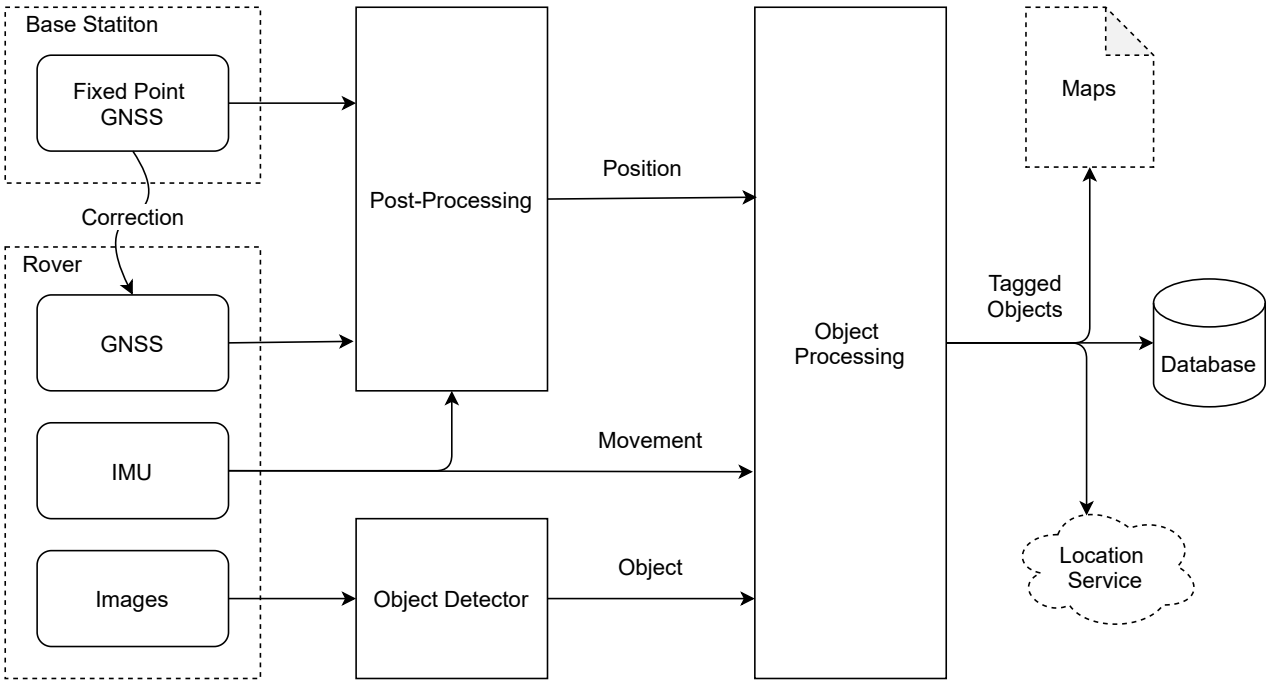
which will be mounted on a vehicle and capture images with location information.

A base station

which has a main role of providing location correcting information to the rover to archive higher accuracy

A software

which has ability to recognize objects in captured images, calculate their coordinations and export the geographical information to Map, or any GIS application.



WonavCT System Overview

2. Hardware

Raspberry PI B+

- Broadcom BCM2835 (700 MHz)
- 512 MB RAM

- 5 MPx Camera

Navio RAW

- U-blox NEO-6T GPS, 5Hz
- NMEA, RTCM3 message
- GPS/SBAS (WAAS, EGNOS, MSAS) L1 Band
- 3-axises IMU at 100 Hz

GNSS Antenna

- LNA: 40 dB

Wifi W725N

- Access Point for Mobile Control

EDGE/3G SIM Modem

- Internet access for communication between Rover and Base Station

3. Software

Realtime Kernel from Navio

- Based on Raspbian (Debian), repo: https://github.com/emlid/linux-rt-rpi
- Overclock (optional)

```
sudo nano /boot/config.txt
# add below lines
force_turbo=1
arm_freq=1000
gpu_freq=300
sdram_freq=600
```

- Increase GPU memory for camera work

```
sudo nano /boot/config.txt
# add below lines
gpu_mem=256
```

- Increase USB current

```
sudo nano /boot/config.txt
# add below lines
max_usb_current=1
```

- Open SPI and I2C port

```
sudo nano /etc/modprobe.d/raspi-blacklist.conf
# add `#` before below lines
blacklist spi-bcm2708
blacklist i2c-bcm2708
```

```
sudo nano /etc/modules
# add below lines
i2c-bcm2708
spi-dev
i2c-dev
```

RTKLib

Repo from Emlid: https://github.com/emlid/RTKLIB\

Base repo: https://github.com/tomojitakasu/RTKLIB

Wifi Driver

TPLink WN725N version 2 driver is used.\

Refer to https://wikidevi.com/wiki/TP-LINK_TL-WN725N_v2 and\

http://elinux.org/RPi_USB_Wi-Fi_Adapters#Working_USB_Wi-Fi_Adapters.

3G Modem Driver

GPRS/EDGE/3G modem driver is built from https://github.com/sk-vpohybe/stopa-monitor/wiki/3G-modem-Huawei-E169-E620-E800,\

refer more in http://elinux.org/RPi_VerifiedPeripherals.

> ⚠ **This option only work when 2 modems have the same 3G provider for their SIM, and the IP addresses are publicly accessible.**

> ✎ **Only RTK mode need internet communication**

Setup on Rover and Base Station

```
sudo nano /etc/wvdial.conf
# add profile
[mobi]
Init1 = AT
Init2 = AT+CPIN="0000"
Init3 = AT+CGDCONT=1,"IP","internet"
Init4 = ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
Phone = *99***1#
ISDN = 1
Username = mms
```

```
Password = mms
Modem = /dev/ttyUSB0
Baud = 460800
Stupid Mode = on
```

Dial to connect to the Internet:

```
sudo wvdial mobi &

# check the IP address
--> WvDial: Internet dialer version 1.61
--> Initializing modem.
--> Sending: AT
AT
OK
--> Sending: AT+CGDCONT=1,"IP","internet"
AT+CGDCONT=1,"IP","internet"
OK
--> Sending: ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
ATQ0 V1 E1 S0=0 &C1 &D2 +FCLASS=0
OK
--> Modem initialized.
--> Sending: ATDT*99***1#
--> Waiting for carrier.
ATDT*99***1#
CONNECT 7200000
--> Carrier detected.  Starting PPP immediately.
--> Starting pppd at Tue Apr 30 19:15:34 2013
--> Pid of pppd: 2475
--> Using interface ppp0
--> Authentication (CHAP) started
--> Authentication (CHAP) successful
--> local  IP address 10.144.158.201
--> remote IP address 10.64.64.64
--> primary   DNS address 213.151.200.31
--> secondary DNS address 85.237.225.250
```

4. Operation

1. Get a precious accurate location of the Base Station
2. Turn on Base Station, setup to send RTCM3 messages on a `tcpsvr` through 3G IP address
3. Turn on Rover, and setup to receive RTCM2 message from Base Station on a `tcpcli` through 3G internet