

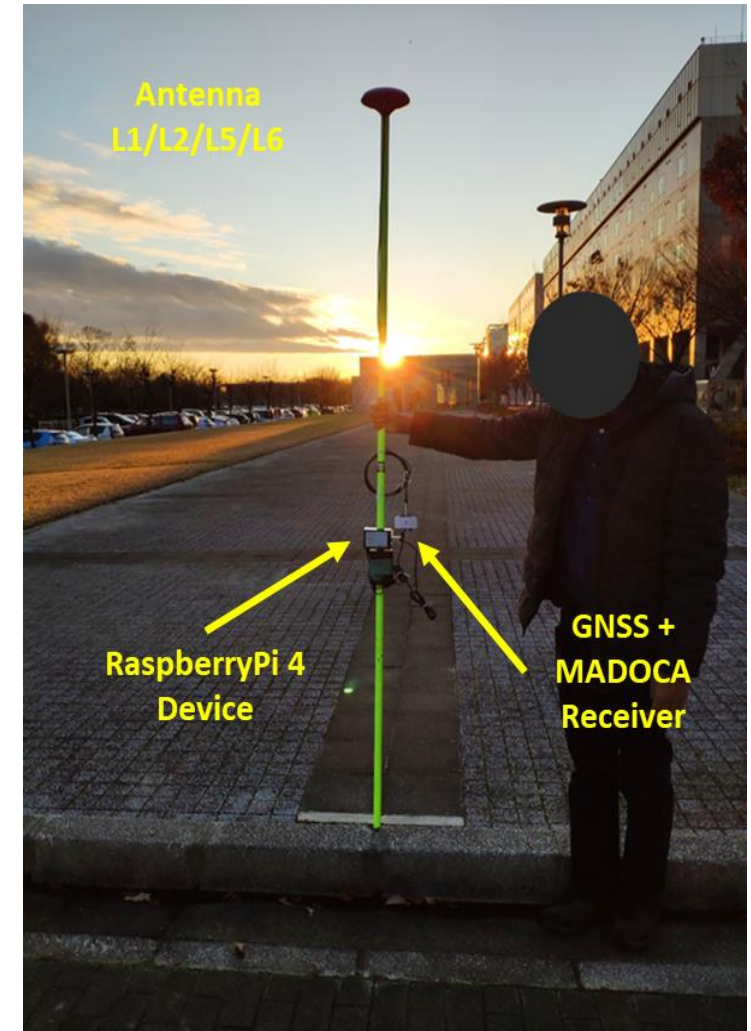
GNSS Data Processing for High-Accuracy MAD-PI Software

Dinesh Manandhar

Center for Spatial Information Science

The University of Tokyo

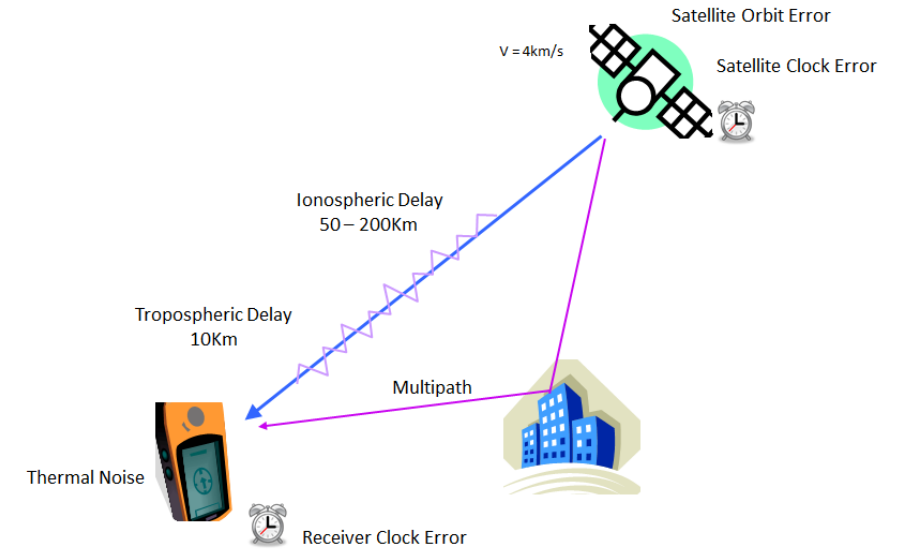
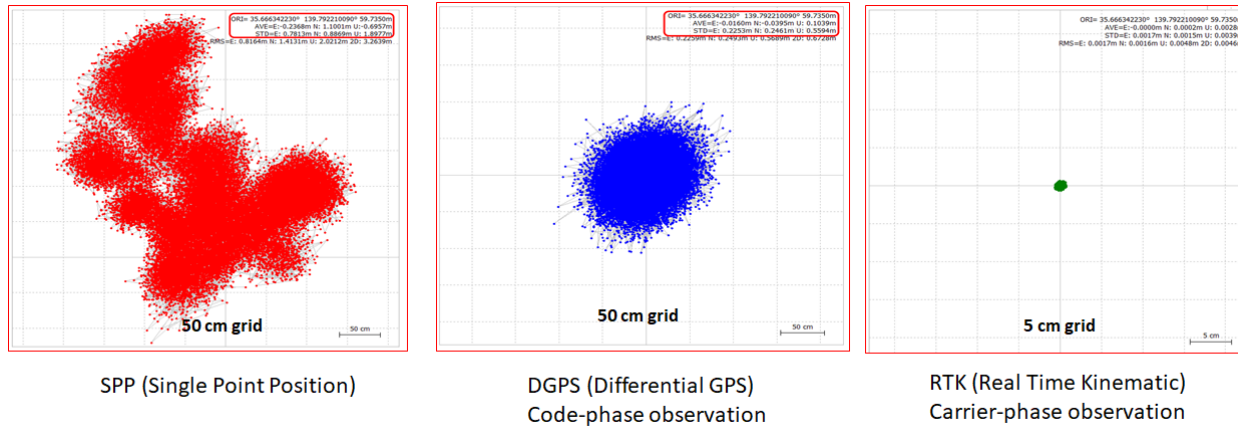
Contact Information: dinesh@csis.u-tokyo.ac.jp



Objectives

- Learn how to process GNSS data for MADOCA-PPP using
 - MAD-PI : MADOCA PPP for RaspberryPi Device

Position Accuracy and Errors



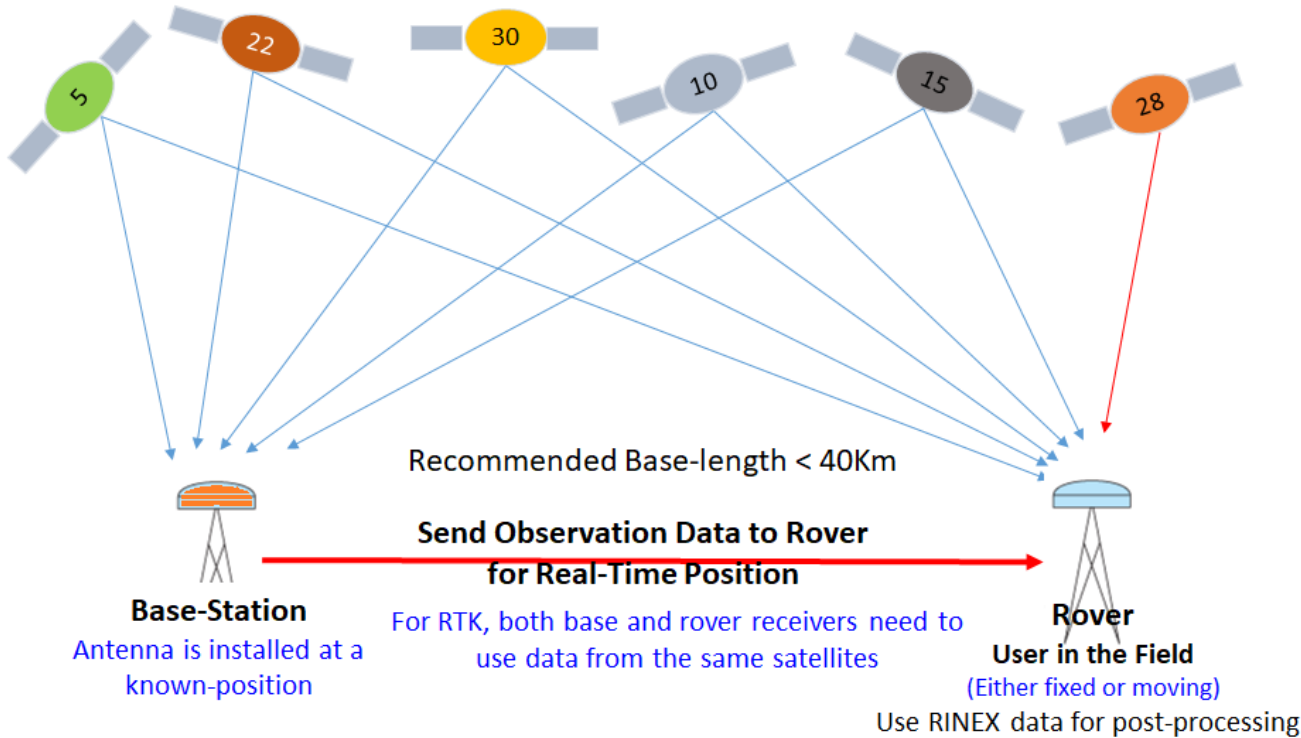
GNSS Position Accuracy:

- Red: Single Point Position
- Blue: DGPS, Code-Phase Observation
- Green: RTK, Carrier Phase Observation

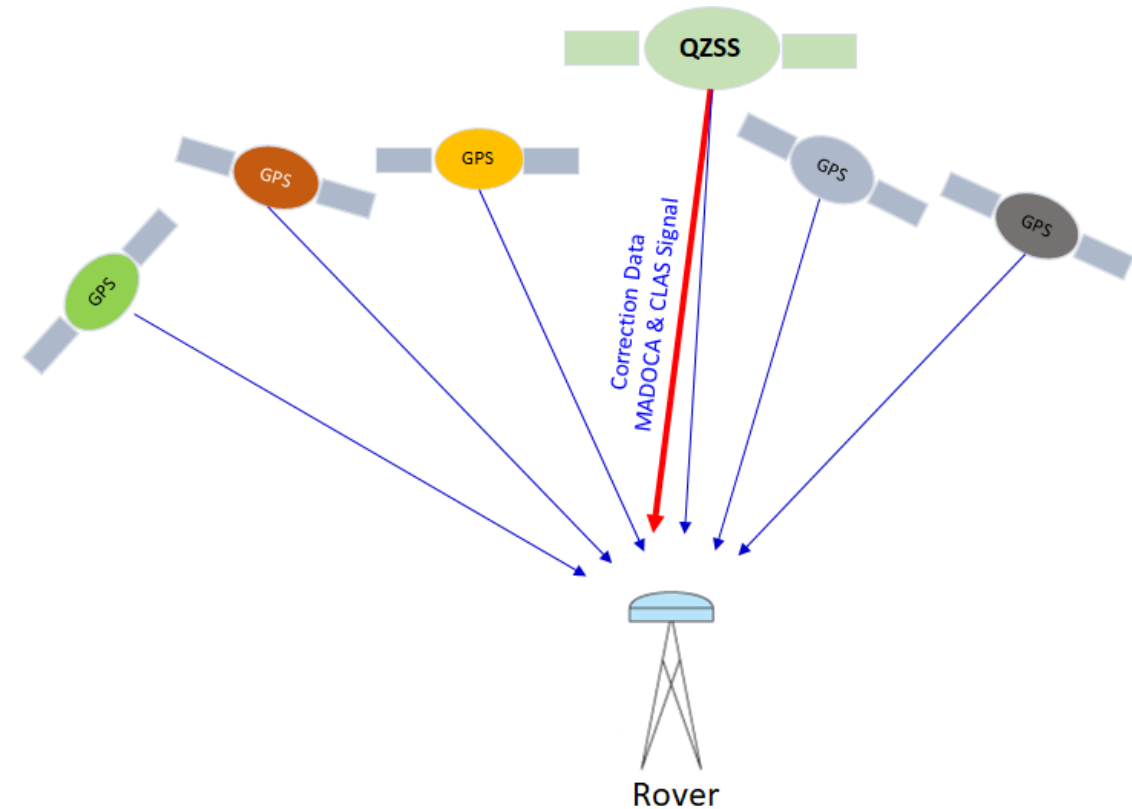
GNSS Errors:

- Satellite Orbit Error
- Satellite Clock Error
- Ionospheric Delay
- Tropospheric Delay
- Receiver Clock Error
- Thermal Noise
- Multipath

Data Observation Methods for High-Accuracy



Data Observation Method for DGPS / RTK / PPK

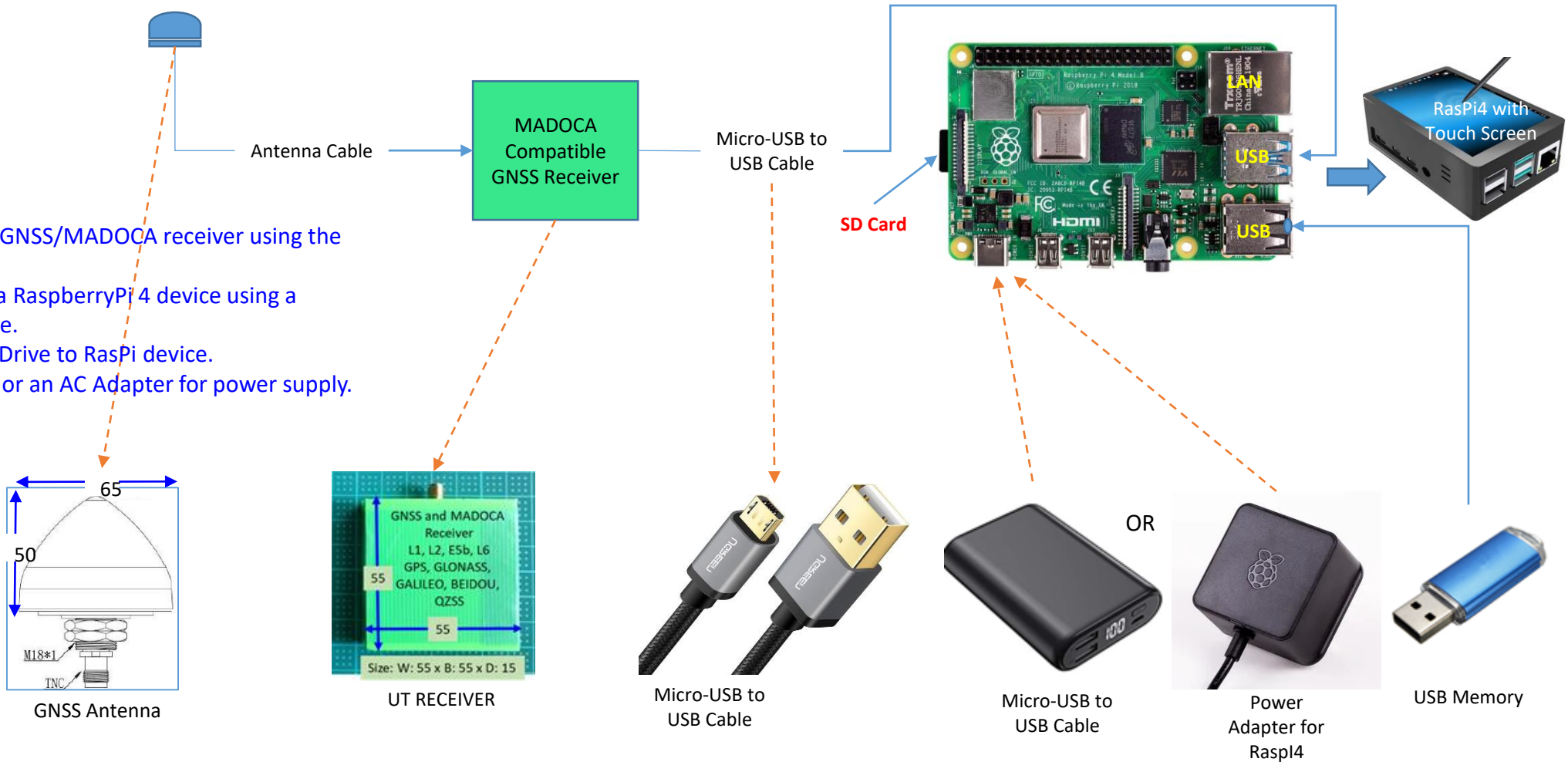


Data Observation Method for MADOCA PPP

MAD-PI Setup

MAD-PI Setup: Receiver and RaspberryPi Device

- Connect Antenna to the GNSS/MADOCA receiver using the provided antenna cable.
- Connect the receiver to a RaspberryPi 4 device using a “micro-USB to USB” cable.
- Connect a USB Memory Drive to RasPi device.
- Either use a Power Bank or an AC Adapter for power supply.



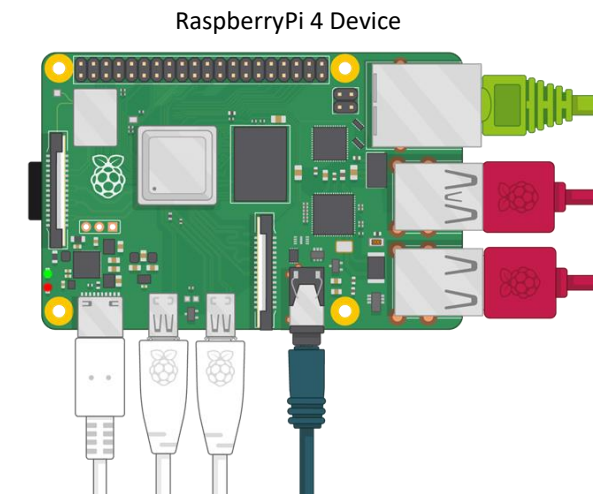
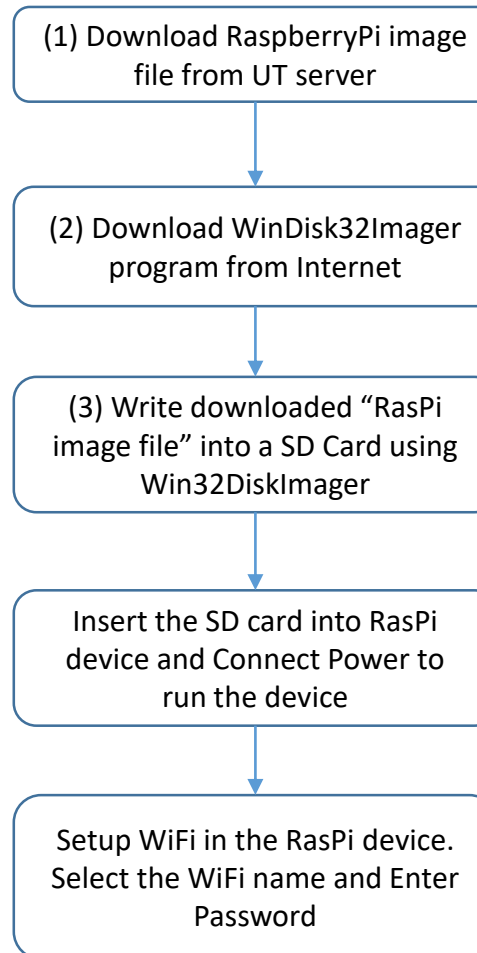
RaspberryPi Device and Software Setup

Download link is provided by UT
The Image File also contains MAD-PI software and
all other necessary drivers for touch screen.

Download Link:
<https://sourceforge.net/projects/win32diskimager/files/latest/download>

Insert or connect a new SD card into Computer.
Use an SD Card of size 8GB or more.
When selecting drive for SD Card, make sure that the drive is correct one.
If your device already has a SD card, it is not necessary to perform the
above steps from 1 – 3.

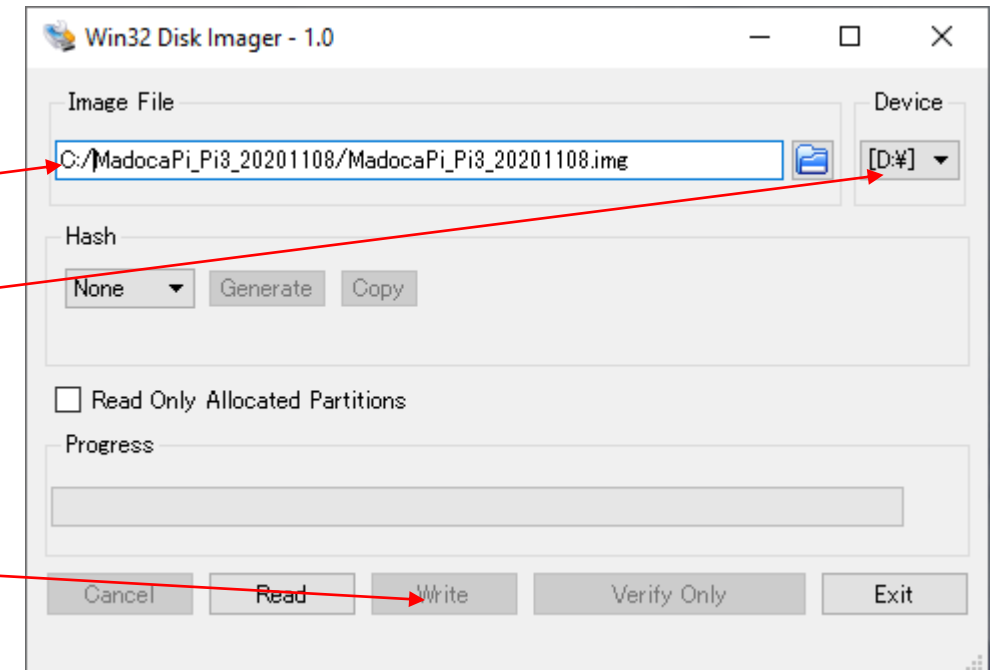
Need to connect an external key-board to type password.
This step is necessary to be done only once for the same WiFi AP.
If new AP has to be used, it is necessary to setup new WiFi AP once again.
You may setup multiple APs if information are already available
WiFi or internet access is necessary only if ONLINE MADOCA Correction data
to be used.
With our receiver, it is not necessary to have internet connection.



<https://www.raspberrypi.com/software/>

Writing RasPi OS Image File to a Micro SD Card

- Download and install the **Win32DiskImager** (from internet).
- Download MAD-PI Image File (zipped) from UT server
- Unzip MAD-PI (Disk Imager File) into your working folder.
- Insert the micro SD card into the slot of your computer.
- Go to This PC icon on your desktop. Check that the micro SD card is shown under the Devices and Drives, such as Drive D.
 - **Do not format the card in Windows even if a message such as “..Is not Formatted. Do you want to format?”**
- Double click to open the Win32DiskImager. Allow to make changes to your computer by clicking Yes.
- Select the MAD-PI image file under Image File by clicking on the browser () as shown in the figure.
- Select D: drive (micro SD card) from the drop-down box in Device.
 - **Make sure that this is the SD Card drive. It will erase all existing data in the drive.**
 - **Do not select a drive of your PC by mistake.**
 - **Drive may be D or E or something else in your PC.**
- Click on Write.
 - This makes the SD card ready to boot in RasPi device with all necessary OS and MAD-PI software.
- The Progress bar shows the progress of writing the disk image file into the micro SD card. Wait for the Progress bar to show 100%.
- After a message is displayed that the write is successful, you can remove the micro SD card from computer.



MAD-PI GUI

- MAD-PI GUI are the same as MAD-WIN
 - Please check MAD-WIN document