Face recognition system with RFID

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Goals (and result)

- Read Mifare 1K card (can do)
- Query to get user associated with such card (can do)
- Face detection, extraction, training and recognition (can do)
- Putting it all together (fail, reasons later)

GitHub link:
https://github.com/ntpt7921/RaspPi_AttendanceSystem

General overview of project

- Detect and read card ID
- With card ID, query the local database to get info
- Such info includes where to find recognition model
- Using face detection to extract face captured in camera
- Load the recog model and authenticate using extracted face
- A new model can be trained and added

Read Mifare card

- Mifare card can easily be read by PN532 breakout module with provided library
- Many function already provided (wait for card, authentication, read, write)
- Each Mifare card have 0 block unwritable
  - Meaning content of this block can be use to identify cards
- We only wait and read block 0 of each card

Database

- Nothing interesting, just a simple associated array (`dict` data type in Python), mapping ID to model name.
- Can save and load content from a JSON file

About face detection and recognition

- Use OpenCV (4.5.1).
- Differenciate:
  - Detection: Figuring out which part in a picture is a face
  - Recognition: Mapping a face to a ID
- Detection: Use mainly OpenCV's DNN, but also implement Haar and LBP
- Recognition: Only use OpenCV's LBPH

Face detection

- There are three option:
  - LBH: Fast, less ambience light sensitive
  - Haar: Slower, sensitive to lighting condition, but more accurate
  - DNN: As fast as Haar, better accuracy
- Link to article comparing these in note file on GitHub
- Choose to use DNN

Face recognition

- There are many possible method, but implement only LBPH
- Work on similar principles with LBH detection

Reason

- First, the current state:
  - Read card (can do on RaspPi)
  - Database (can do on both RaspPi and laptop)
  - OpenCV using the camera (can only do on laptop)
  - OpenCV face recognition and detection (can only do on laptop)
- Error trying to get OpenCV to open the camera pipeline
  - Try using raspberry's apt repo
  - Try compiling OpenCV locally
  - Also try using pip repo
- Maybe my RaspPi4 don't have enough RAM

Reason

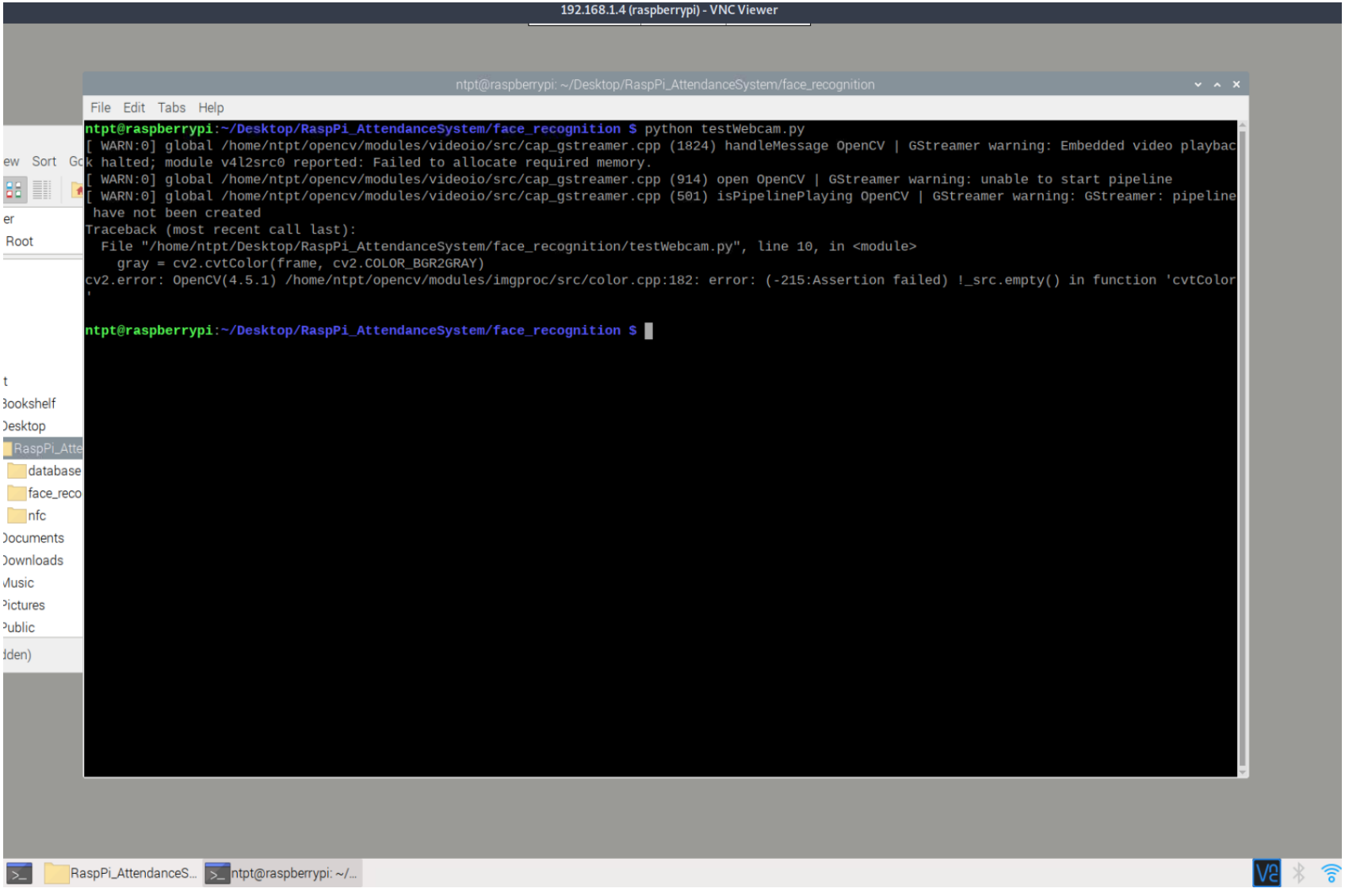

Figure 1: Error when trying to use camera on RaspPi