QR Code Program User Guide

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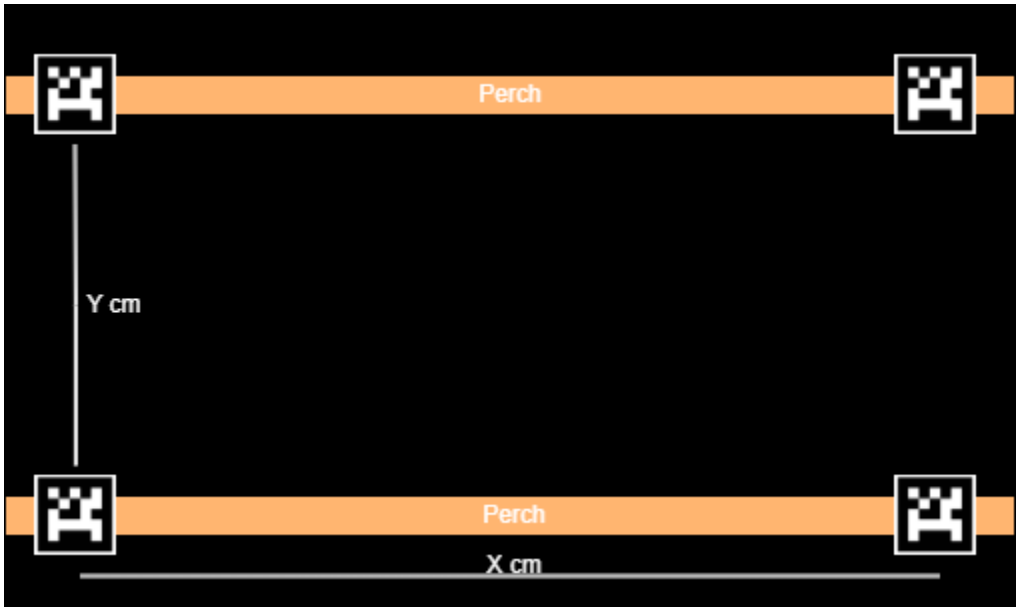
Program Developed for Wright Lab

Table of Contents

Introduction

This program was developed to help researchers save time on creating proximity-based social networks. The program utilizes QR codes worn by the study species and video footage to track each QR code and calculate distances from each individual, used in proximity-based social networks. The program aims to automate the process of scoring footage, saving researchers time, and allowing for more accurate data collection. Any terms in italics and underlined will be further explained in the glossary.

Experimental Setup



Above is a diagram of our experimental set up as viewed through the recording camera. In each of the four corners of the cage we have QR codes at known distances from each other used for calibration. It is important to create these QR codes from a different *QR Code Family* than those placed on your species of interest. This part is especially important as you do not want the program to mistake these for individuals. As the calibration is manual it does not matter what type of markers you use as long as you know the distances between them.

Tip Using colored QR codes on your study species will help human scores to identify each individual when missing.

Installation

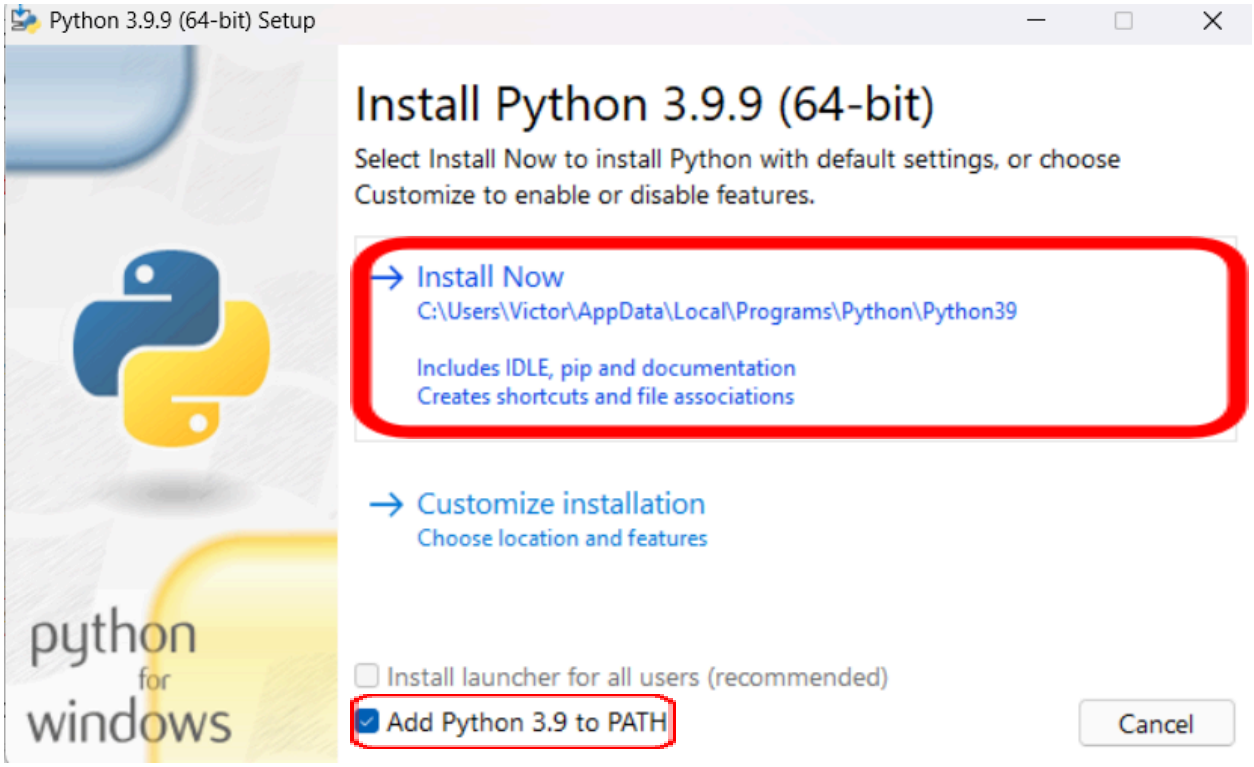
The code as well as an installation guide video can be found at
https://github.com/movie99/QR_code

Step 1.
Download Python 3.9.9 at https://www.python.org/downloads/release/python-399/ and scroll to bottom of page under files and download version needed for your computer, this guide will follow the windows version of installation and use
Note It is important to use Python 3.9.9 as the program may not work with newer versions

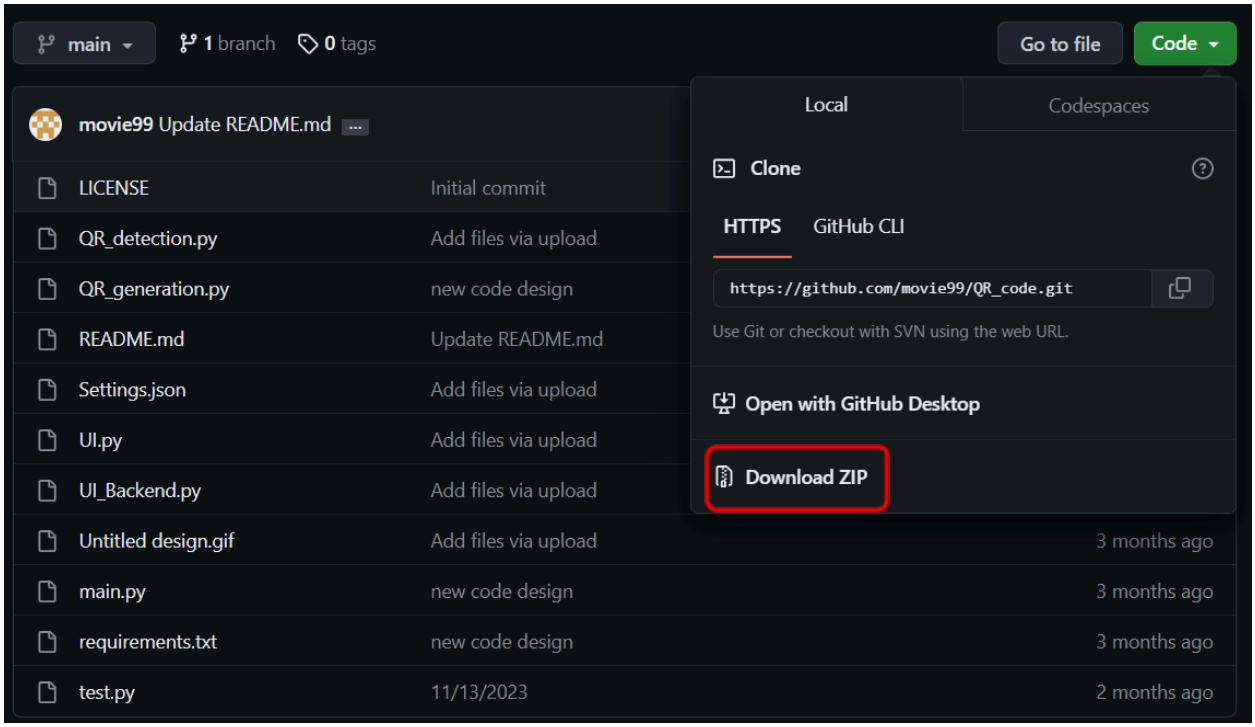
Files

Version	Operating System	Description	MD5 Sum	File Size	GPG
Gzipped source tarball	Source release		a2da2a456c078db131734ff62de10ed5	25787134	SIG
XZ compressed source tarball	Source release		11d12076311563252a995201248d17e5	19144372	SIG
macOS 64-bit Intel-only installer	macOS	for macOS 10.9 and later, deprecated	558d424cd547a3a85c99bd5675b67370	30060309	SIG
macOS 64-bit universal2 installer	macOS	for macOS 10.9 and later	ff07b39be8e4a58a09aabe4d4f0efd64	38168250	SIG
Windows embeddable package (32-bit)	Windows		a54f24cee83fe5ef2e65f707b3af4fc2	7660516	SIG
Windows embeddable package (64-bit)	Windows		7129c695fff6bf19d5b2e1a4ff86a3e8	8473749	SIG
Windows help file	Windows		90109a4c9e7ee67f504b6a9f79201c6a	9277937	SIG
Windows installer (32-bit)	Windows		41566bd99961047c8332d46bd3dd90fc	27738360	SIG
Windows installer (64-bit)	Windows	Recommended	a09ef64c9ea2e7d9a04a2cafb833aa7b	28829104	SIG

Step 2.
Once the .exe file is downloaded, open it and select “Add Python 3.9 to PATH and select Install Now and installation of Python 3.9.9 will begin

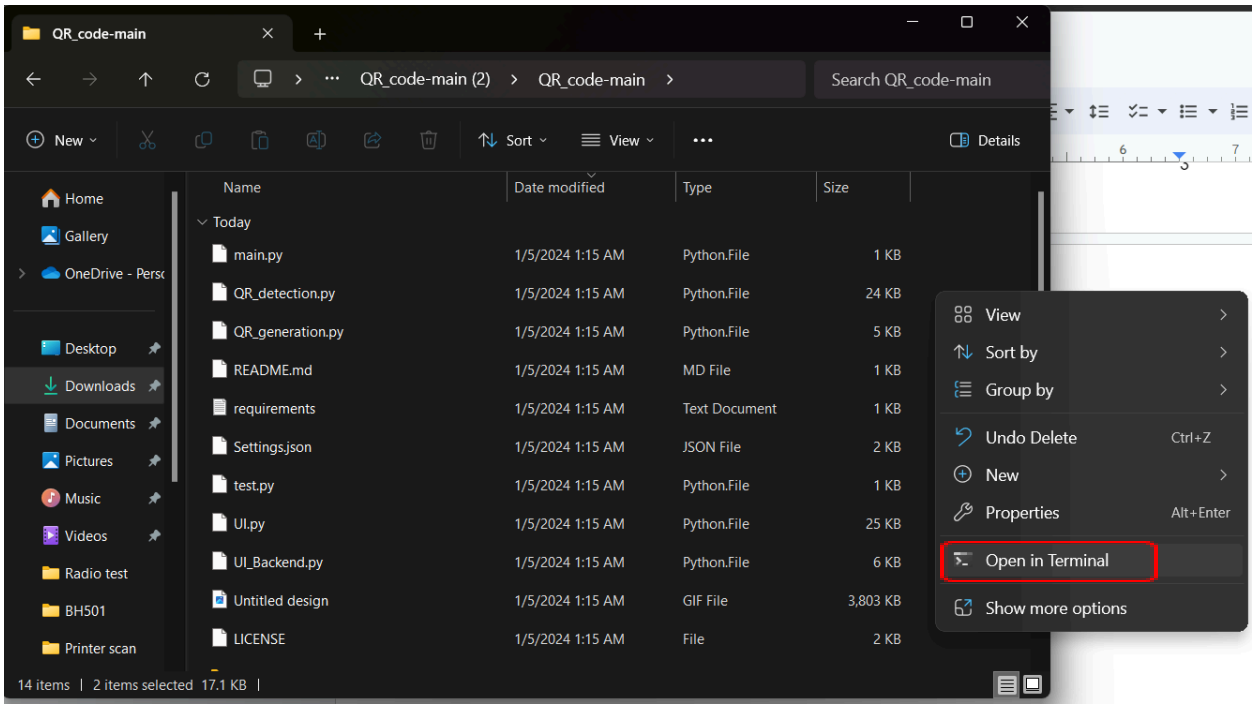


Step 3.
Go to “Code” tab in green and download zip file



Step 4.
Extract all files from zip file

Step 5.
Next open folder and open in terminal by right clicking while folder is open



Step 6.
Copy and paste the following commands

pip install -r requirements.txt
python main.py

Allow for necessary packages to install and once complete you have successfully installed our program.

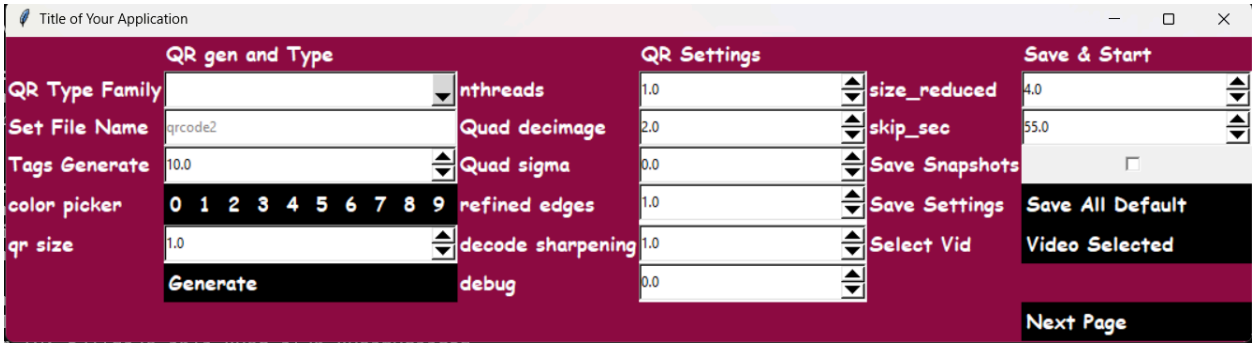
Note if you encounter the following error message,
ERROR: Could not open requirements file: [Errno 2] No such file or directory: 'requirements.txt'

You have not opened the correct folder in the terminal. Please make sure you are opening the folder and then selecting “Open in Terminal” refer to Step 5.

Operation

Starting the Program

1. Open folder in terminal (see step 5 of installation)
2. Paste command “python main.py” (no quotation marks)
3. Hit enter and this menu will appear when successfully opened



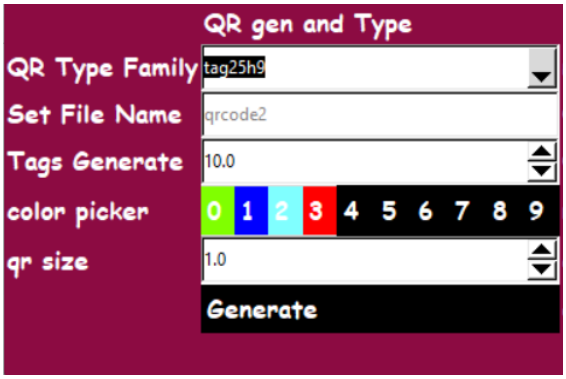
Generating QR Codes

1. Select QR Family Type and select which *QR Family Type* to use (we use tag25h9)

2. Select your file name
    a. This is the name that will be used to name the QR code file so choose whatever you will find easiest

3. Select the number of QR codes you wish to generate

4. OPTIONAL you can also select the color of each QR code by clicking on the number assigned to each qr code under “color picker” and a color selection tab will appear
    a. Although our program does not utilize color detection it helps human observers keep track of each individuals identity for manual selection

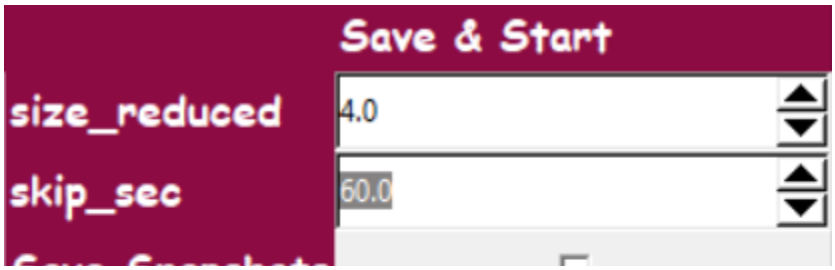


5. You can scale the size of the QR codes to make them larger or smaller
    a. Default value is 1 which is 100%

6. Click generate and a file will appear named based on the input from step 2. You can then print the file and place QR codes on you species of study

Setting time interval

Our program will scan a single frame of video for all individuals and will move on to the next frame at a specified interval. Depending on your research you may need a different time skip interval and so in our program we have the option to set any time skip interval needed under the “skip_second” input shown below just use the up and down arrows to the number of seconds.



Save Snapshots and Settings

Our program allows you to save your settings to override the default as well as save every *snapshot* which could be useful for future reference.

- To save snapshots just select the box next to “Save Snapshots”
- To save current settings and use current settings as the default option select “Save all default

Video Selection

In order to select your video you wish to run select “Video selected”

This will open your computers file explorer where you will then select the video of your choice *Tip* - you can select multiple videos by holding CRTL and selecting your videos

File Settings

To access file settings please click on the “next page” tab at the bottom right of the main menu. This will open the following window. These inputs will be used in the file name of the output data

Experiment Name - input name of your experiment

Round - input round number (useful for replications of experiment)

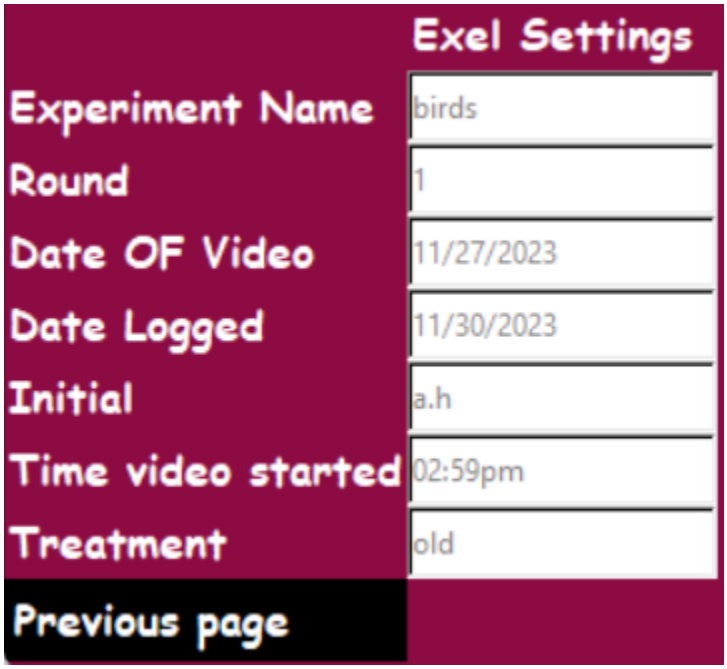
Date of Video - input the date of when the video was taken

Date Logged - Input the date of when the footage was scored

Initial - Initials of who scored the video

Time Video Start - input the actual time of when the video was taken

Treatment - name of treatment in video



Scoring Video

Step 1.
After opening program set your parameters and set your file name before selecting your video

Step 2.
Once your videos are selected the first frame of the video will appear. Once this occurs click on two of your calibration points (refer to setup) and enter the distance between them in cm and click ok.

Step 3.
Next a new menu will appear where you can visually inspect each snapshot as well as manually assign any missing individuals.

In this instance the individual assigned QR code 4 is not picked up by the program. To correct this we click on the number 4 in the menu and with our cursor we will click on the center of the QR code.

Once we have made sure that all individuals are accounted for click on ‘Next’ to move the next snapshot.

Step 5.
Once you have gone through the entirety of the video; the video window will then close and you can find your excel file in the program files folder.

Glossary

Snapshot -

Every frame which the program scans to look for QR codes. Ex. a 100 second video with a 10 second time skip will have 10 snapshots where the program will look for QR codes.

QR Family Type -

Our program uses ArUco QR codes to track individuals. These markers are divided into three families. The family that we use are the tag25h9 family as they are of medium size. Further reading on the ArUco markers can be found at https://docs.opencv.org/4.x/d5/dae/tutorial_aruco_detection.html