

# Documentation for Maze Master

A program for creating and executing experiments in virtual mazes.



## Creating/Loading a Maze

Create a new Maze by opening the Maze Designer via the appropriate button. After creation, it has to be loaded. An existing maze can be loaded by clicking on the *Load Maze* button.

## Configure Experiment

In General Settings:

- 1.) Choose a place to save the data to (or nowhere to not save any data).
- 2.) Choose an Experiment Type (or undefined).
- 3.) Choose a Task from the List (or undefined).
- 4.) Enter Mouse ID

If you want to set up the save data path manually, hit the set manually box

Most of the configuration should now be adjusted to the chosen experiment type. If not, change it manually (see *Settings*).

## Start Session

Start Blender and position the window either manually or automatically with the Autoposition button in the Server Control panel.

Connect to Blender via the connect Button (green check mark) in Server control. After clicking the button, the program will wait for Blender (for max 20 sec) to connect to MazeMaster. You have to start Blender with pressing the P button on the keyboard after clicking into the Blender window. Now the network connection should be established, the software should indicate this with changing the connect status.

If everything is ready to start the trials, click *Start block of trials* in the trial control panel. Now the trials should start either directly, or after a certain speed is reached on the wheel (depends on start recording).

## Settings

Maze Feature Settings, Load Texture (default): This loads the texture for the walls of the virtual maze. It should be square-cut.

Start tracking: if directly, tracking mode will start on experiment startup automatically. This only saves the position in the VR maze to the data files in the time interval entered. Everything else is saved anyway, like the wheel position or entering a reward or a sensor.

Start cameras: check *directly* to start the acquisition of either the pupil or mouse cam with the start of each trial automatically.

Start recording: Defines whether the trial and associated acquisition (e.g. Scan Image) should start directly or after a certain speed on the wheel is reached.

Supply reward: Check per trial to give a water reward with reaching the reward zone/ end of corridor. The time defines the opening time of the water valve. *Flush manually* opens the valve with clicking the button. Another click closes it again.

Flash cues: Flash visual cues manually. Select a cue out of five preassigned cues and flash it to the wall (left, right or both) with a click of the *flash cue* button for the time entered. You can load a new cue to the selected cue via clicking *Load Pic*, overwriting the current cue if necessary.

Server: status of the connection to the engine.

Use Device: configure whether to use the input through the computer mice or to use input through a National Instrument based counter (using NI Nidaqmx).

Save a comment: Here you can enter a comment, which is saved for the current trial. You can find it in the metadata file.

Block and trial settings: Enter trial settings here. *Max no of trials* defines the number of trials after which the program stops. A zero indicates an unlimited number of trials. *Max trial duration* defines the time after each trial is aborted and a new trials starts automatically. *Inter-trial interval* defines the time between two trials (in addition to the possible waiting time for wheel trigger). *Max trial distance* gives the number of steps, after which the program stops the trial and starts a new one (zero means infinite number of steps).

## Using Rules and sensors

The maze can hold several sensor (or virtual "light-barriers") which can trigger different events automatically. Most of the time this is used for the automatic placement of visual cues after passing through one or more of these sensors. To set this up, open the Rule Designer by clicking the button in the Maze Feature Settings panel and enable it with checking the *use rules* option. To use sensors more than once enable the *reusable* option in sensor barriers. You can set a delay after which the sensor can be used again. This value should be greater than zero.

### Rule Designer:

Each line in the Rule Designer represents a rule for what should happen after passing through a sensor. Choose a sensor first. The number of the sensor is indicated on the grid with a little

number next to it. Choose an additional sensor if passing through two sensors in a row should to trigger the event. If a cue should be showed, choose one together with a direction. If two cues should be shown simultaneously, choose the second one, which is shown on the left side (unless shuffle cues is active). Activate *Shuffle cues* to show the two cues randomly on the two sides. In a T-maze, the first cue is the target one. If an additional wall (false wall) should be activated, it has to be set with the dropdown menu. If the virtual mouse should be teleported, mark the *Use Teleport* option. The virtual mouse is then teleported to the teleporter point, after passing through the sensor. You can also save and load the complete rule settings.

## Adjusting the Tunnel

When creating a tunnel for the virtual corridor check *enable wall pictures* in the Maze Designer. This allows you to use different hallway pictures as textures for the virtual corridor walls. Those are load through the *Maze Feature Settings* panel. The Length to height ratio of the pictures load should match the length to height ratio of the virtual corridor. One square on the maze grid equals the height of the corridor.

## Adjusting the Virtual Maze: T-Maze

Define the two sensors which define the end of the two target arms of the t-maze in the script. Use the variable *TmazeEnd* as following:

`TmazeEnd = [3, 2]`

The first number indicates the number of the sensor for the left arm, the second the right one. Define the rules via the Rule Designer (see above).

## Closing the Experiment

After finishing the Experiment the connection can be closed by clicking on the Stop Server button. The protocol will be automatically saved in the data folder. Always exit the program by clicking the *Quit* button.