Assumptions

Server

- There is no prerequisite to join the server.
  - Reason: All new connections are automatically accepted and given a role.

Client

- Synchronization sensitive functions should not be called directly after a client connects to the server.
  - Reason:
    * External packages (e.g. jQuery, Bootstrap) can still be loading. Which can slow down other connections (to the server for example).
    * The client and server communicate every second to calculate the emit time. The last ten results are stored to calculate an average from.
- All clients should use a sufficiently modern browser.
  - Reason: The extensive usage of *let* necessitates the support of the browser.

Analyzed pictures

- A room with light.
  - Reason: If the room is dark and a picture of a colored screen is taken, a glow even around the screen is often observed. This glow will have similar color than our screen and could wrongly be detected by the color detection as part of the screen.
- No light in the camera view.
  - Reason: Colors of pictures taken by a camera are often not exactly correct. Bright lights often have a shade of light pink which might be detected by the color correction algorithm.
- Pink objects that are not screens can only be in the master image if they are in every picture taken. Otherwise this will cause screens to be detected incorrect.
  - Reason:
    * Imagine that the first picture, with all the blank screens is taken. Afterwards, a pink object enters the scene, and an image with a

pink screen is taken. Both the object and the screen will create a difference in color with the original image. If the object is big enough this will cause the screen to not have the right dimensions.

Screen detection

- Screens have a width and height of at least 50 pixels.
  - Reason: At the end of screen detection, we are left with a set of pixels assumed to be on the edges of the screen. We use the end points of the longest two connections as corners. To assure we essentially do not end up with the same corners twice, we assume that if there are two end points of these connections closer than 50px apart, they are the same end point.
- In the picture, the edge pixels should, in a range of 2 pixels, have at least 10% pixels with a similar color around them and max 55%.
  - Reason:
    - 10%: The pixel is considered an error point (not part of the screen).
    - 55%: The pixel can't be part of the edge because it has neighbors on more than two sides. We take a 5% error margin to allow detection of points close to the edge as well.
- If the camera is not steady during the process where the different pictures are taken, detection of the screens will work, but the coordinates of the corners will be off by the amount of pixels proportional to how much the camera moved.
  - Reason:
    - For every screen we take a picture where the screen is blank and a picture on which the screen displays bright pink. By comparing these two, the corners can be detected. If the second picture is shifted to the right/left, the algorithm will identify the corners as being shifted as well.
- The resolution of the image needs to be higher than 640x480 for the screens to detected correctly.
  - Reason:
    - The pixels are compared individually to find a difference between them. If this difference is big enough, the screen can be detected. With a resolution that is too low, the pixel data is not as accurate and thus the differences will be incorrect. This will result in the algorithm not/incorrectly recognizing certain screens.

Triangulation

- The centers of two or more slaveScreens can not have the exact same coordinates. This means that in particular that a smaller screen may never lay perfectly centered on top of another larger screen.
  - Reason: The algorithm will work with two points with the same x -and y coordinate but because it looks like two different points for the algorithm it is able to create a line between them. If we then calculate the angle between a line starting/ending in this point we always get the angle of this line and the x axis. This can lead to the algorithm not detecting lines to be deleted. Also the resulting circumscribed circle will be wrong.

Image Cut

- No overlap between screens.
  - Reason: The image is cut to fill the screen as found by the screen detection. This exact cut is what will be send to the slave. The slave has no sense of where to align the image to, thus scales it to fit.