2. User requirements

These are acquired from two documents. One is Pascal's graduation report and the other one is an SRD for the Connect-4 from 24-06-2019 from Jeroen Grollenbeek, Ralph Lentink and Arjan Verboord. They were slightly modified to reflect current progress.

ID	Requirement	Description / explanation	Priority
UR.1	The user should be able to start and play a game of Connect-4 against the robotized opponent without operator intervention.		Must
UR.2	The user shall be notified when the game ends.	The system must communicate somehow who won (sounds, visual, giving a token).	Could
UR.3	The robot should detect a cheating player and respond by resetting the game.	A cheating player is someone who plays out of their turn, or someone who inserts two coins or more at once in one or several columns	Must
UR.4	A Board Support Package (BSP) must be made of the operating system with which the necessary hardware components of the robot can be controlled.		Must
UR.5	A physical demo must demonstrate that the modular structure of the software architecture is applicable and functioning.		Must
UR.6	The insertion of a game token in an arbitrary column shall be detected by the photodiodes and IR sensors.		Must
UR.7	The system is able empty the playfield, separate the tokens by colour and prepare itself for the next game.	A total reset of the play environment.	Must
UR6.1	After a game, the tokens must move to the sorting base, by emptying the game board column by column.	In order to avoid obstruction during clearing the board game and make the token checking principle easier.	Must
UR6.2	From the sorting base, the yellow and red tokens shall be sorted and returned to their belonging base.		Must
UR6.3	A flipper will shoot the human (yellow) tokens back to their base.		Must
UR.8	The robot head should be controlled to the desired X and Z position within 1.5mm accuracy		Should
UR.9	The robot end effector should suck up tokens by actuating the pressure air pump.	Research needs to be done on the sucking power w.r.t. the tokens.	Must
UR.10	The robot end effector must release the token at a given position to insert the token into board.		Must
UR.11	The algorithm running on the Raspberry Pi could be integrated on the new STM32H7 dual-core.		Could

Commented [IB1]: A could because such a system doesn't exist as of now. No display, buzzer. A special sequence could be made and a new token could be 3D-printed, alongside maybe a special place to signal to the user that the game has ended.
But it felt a bit less important than the other features.

Commented [IB2]: more conditions?

Commented [IB3]: Must or Should ?

These were acquired from another document. A master-test plan by Jasper Jansen from 09-04-2019. They were slightly modified to reflect current progress.

Unit Test Plan

- Timing interrupt
- Vacuum components
- End-switches
- Home-switches
- Encoder readout
- PID calculations
- Motor control
  - X-axis
  - Z-axis
- Servo control
  - End-effector rotation
  - Board clean-up piece
- Movements
- Token detector – entry point
  - Multiple tokens at once in a single column
  - Multiple tokens at one in different columns
- Flipper control
- RGB sensor
- Emergency stop
- AI's
- Difficulty setting
- Power/Reset button
- Subfunctions?

Commented [IB4]: (Do we still need this? Are there moves missing?)

Commented [IB5]: Are these two still applicable ?

Integration Test Plan

- Initialization sequence
- Home procedure
- Normal play sequence (put token inside column)
- Token separation sequence: column by column (new)
- Token sorting sequence (new)
- Cheating Procedure (worst case scenarios)(new)
- Emergency stop and recovery procedure

System Test Plan (use cases?)

- Starting the system
- Playing of multiple games
  → winning
  → losing
  → different difficulties
- Shutdown
- System is able to play for multiple hours (new)
- Maybe start with sorting procedure (the robot has to know which colour is his)(new)

Commented [IB6]: Michael and I were thinking along the following lines. What if wrong tokens are fed into the system. Some yellow tokens with the reds or vice versa. The system won't recognize those until only after the game is over and they are sorted.