Hochschule Karlsruhe
University of
Applied Sciences

Prof. Dr.-Ing. Björn Hein, Prof. Dr.-Ing. Christian Wurll

Summer Term 25

Specification document "Connect Three"

Design and implementation of the interactive robot-based application "Connect Three"

1. Definition of processes

This description serves to understand the processes and functions of the robot-based application "Connect Three". *Connect Three* is a Two-Person-Strategy-Game with the aim, to place three own stones in a row onto the game board first. Normally the game is played with a vertical game board, on which the players alternatingly drop their individual stones. The board consists in the "Connect Three" version of 6 columns (vertical) and 4 rows (horizontal). Each player has 12 game stones of the same color. If one player drops a stone into one column, it fills its lowest empty position. The player wins who has placed three stones in one row vertically, horizontally, or diagonally. The game ends with a draw, as soon as all positions are occupied, and no player was able to connect three stones in a row.

The robot-based game board is shown in Figure 1. Here the game is played with a horizontal game board.

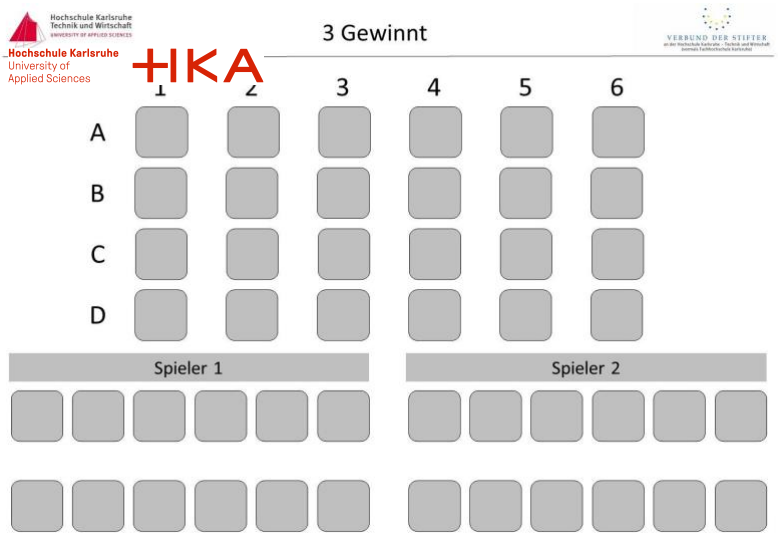

Figure 1: Screenshot of the game board for the robot-based application "Connect Three"

On the upper part of the game board the 6 columns (marked 1 - 6) and the 4 rows (marked A - D) are located. On the lower part, the game stones for the two players (here in German "Spieler 1" and "Spieler 2") are placed manually at the beginning of the game.

2. Specification

2.1 Preliminary works

2.1.1	Set-up game	1. Place board in the work area of the robot 2. Define / Update the respective Base-Coordinate System for the game board 3. Robot is placed in home position 4. With the robot put the colored games stones on the game board at the position player 1 (color one) and position player 2 (color two).
2.1.2	Player area	Area with 12 cubes for the corresponding player

2.2 Programming

2.2.1	Query of game mode	Provide possibility to enter the game mode: 1. Human against human (Default) 2. Human against robot 3. Robot against robot
2.2.2	Query of gravity mode	There are two gravity modes: 1. “Gravity on”: the vertical lines on the player area must be filled from D-A. 2. “Gravity off”: any position on the player area can be chosen
2.2.3	Query of starting player	Provide possibility to choose starting player
2.2.4	Placing of game stones	Alternately, players can select the available fields depending on the game mode and gravity mode. Log the different moves as “Hinweis”-message
2.2.5	Check victory	A player has won, if he has placed three stones in a row (horizontally, vertically, or diagonally). The victory must be notified accordingly.
2.2.6	Reset and clean-up	It is possible to reset the game at any time. All cubes will then be put back according to their color to corresponding player area.
2.2.7	Optimize Movement	Optimize the movement with rounding, where possible.

3. Documentation

3.1	Documentation	As a result of the project, the following documents should be available and included in a comprehensive documentation in this order:

		• Short set-up and operating instructions • Coarse program structure (with explanations) • From essential program parts provide, state diagrams, flowcharts (with explanations), ... • If necessary, data exchange with the other groups (with explanations) • Program listings / source code • Specification document • Video demonstrating a full game with a subsequent clean-up • Suggestions for the further procedure, improvement or optimization of the test stand Size of documentation document should target around 30-40 pages (including pictures, but excluding source-code, specification document, etc.).
3.2	Acceptance - Test	The acceptance is granted after successful live demonstration of the functions acc. Specifications, a discussion about general topics in robotics and the handover of the documentation.

4. Finalization

4.1	Archiving	The project data must be handed over in a ZIP file including: • Documentation • Source code of the project