STM Implement Communication Protocol

The STM communication protocol defines the structure of messages exchanged with the microcontroller.

Command list

Start

Selected in main menu. Starts the game, generates the layout and all tiles. Starts timer from 0:00:00

PC -> STM

CMD	DATA	CRC
0x01	0xFF	XOR

STM -> PC

CMD	DATA	CRC
0x01	0xFF	XOR

0xFF in DATA field means that no data will be sent, only triggering the command itself to start the game.

Reset

Selected in-game, generates new layout. Starts timer from 0:00:00

PC -> STM

CMD	DATA	CRC
0x02	0xFF	XOR

STM -> PC

CMD	DATA	CRC
0x02	0xFF	XOR

0xFF in DATA field means that no data will be sent, only triggering the command itself to reset the game.

Shuffle

Shuffles existing tiles, not changing the current layout itself. Can be used 5 times per game, before getting blocked.

PC -> STM

CMD	DATA	CRC
0x03	0x0A	XOR

For Shuffle command, PC must send all the coordinates of current board to STM (x, y, z) as well as all tiles on each coordinate to shuffle them. Important note: game must shuffle only tiles, not their position, meaning we must save the current board as it is.

STM -> PC

CMD	DATA	CRC
0x03	0x0A	XOR

STM sends new set of tiles to the PC, randomly shuffled.

Select

Selects one tile.

PC -> STM

CMD	DATA	CRC
0x04	0x0A	XOR

PC sends the coordinates of selected tile, as well as it's suit and current condition ("open", "closed").

STM -> PC

CMD	DATA	CRC
0x04	0x01	XOR

STM returns the TRUE if tile is selectable (Meaning, it's properly exposed and no other tile is selected at the current moment)

Match

Selects other tile, comparing them between each other

PC -> STM

CMD	DATA	CRC
0x05	0x0A	XOR

PC sends the coordinates of the second selected tile, as well as it's suit and current condition ("open", "closed").

STM -> PC

CMD	DATA	CRC
0x05	0x01	XOR

STM returns TRUE if our tiles can be matched (the same tile for suits and honors, or the same group for flowers and seasons. Also if both of tiles are exposed). Returns FALSE if any of these criteria wasn't met during comparison.

Set State

Sets in-game state, following set of conditions

PC -> STM

CMD	DATA	CRC
0x06	0xFF	XOR

0xFF in DATA field means that no data will be sent, only triggering the command itself to set game state on STM.

STM -> PC

CMD	DATA	CRC
0x06	0x0A	XOR

STM checks the conditions to set the game state (Whether player is out of moves, out of shuffles to announce game over or successfully matched all tiles for a win) and sends the game state.

Checksum calculation

Calculation: CRC = CMD ⊕ DATA[0] ⊕ DATA[1] ⊕ DATA[2] ⊕ ...

XOR truth table:

A	B	A ⊕ B
0	0	0
0	1	1
1	0	1
1	1	0

If the CRC verification fails, the message must be discarded and an error response should be returned.