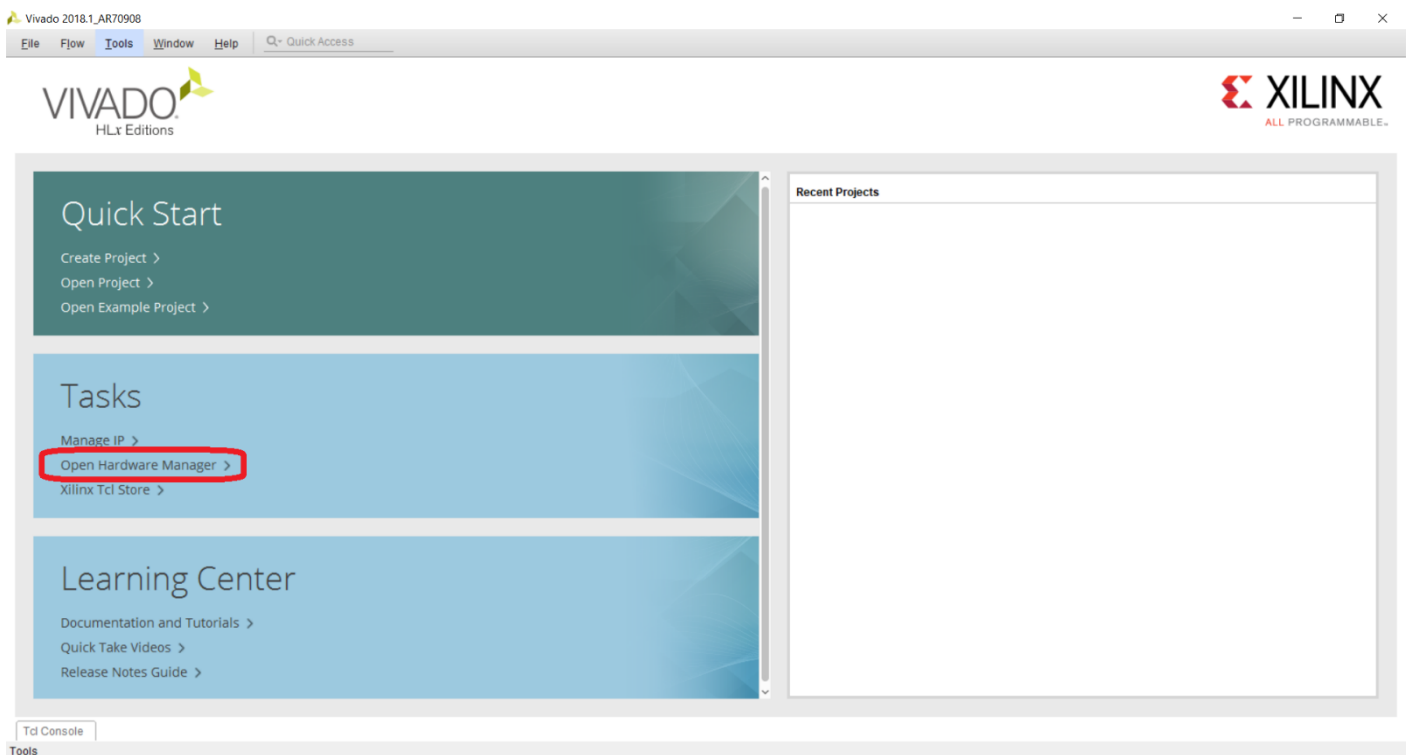# A Framework for the Real-Time Execution of Cellular Automata on Reconfigurable Logic

N. Kyparissas

A Guide for Programming the Nexys 4 DDR Board with Vivado 2018.1
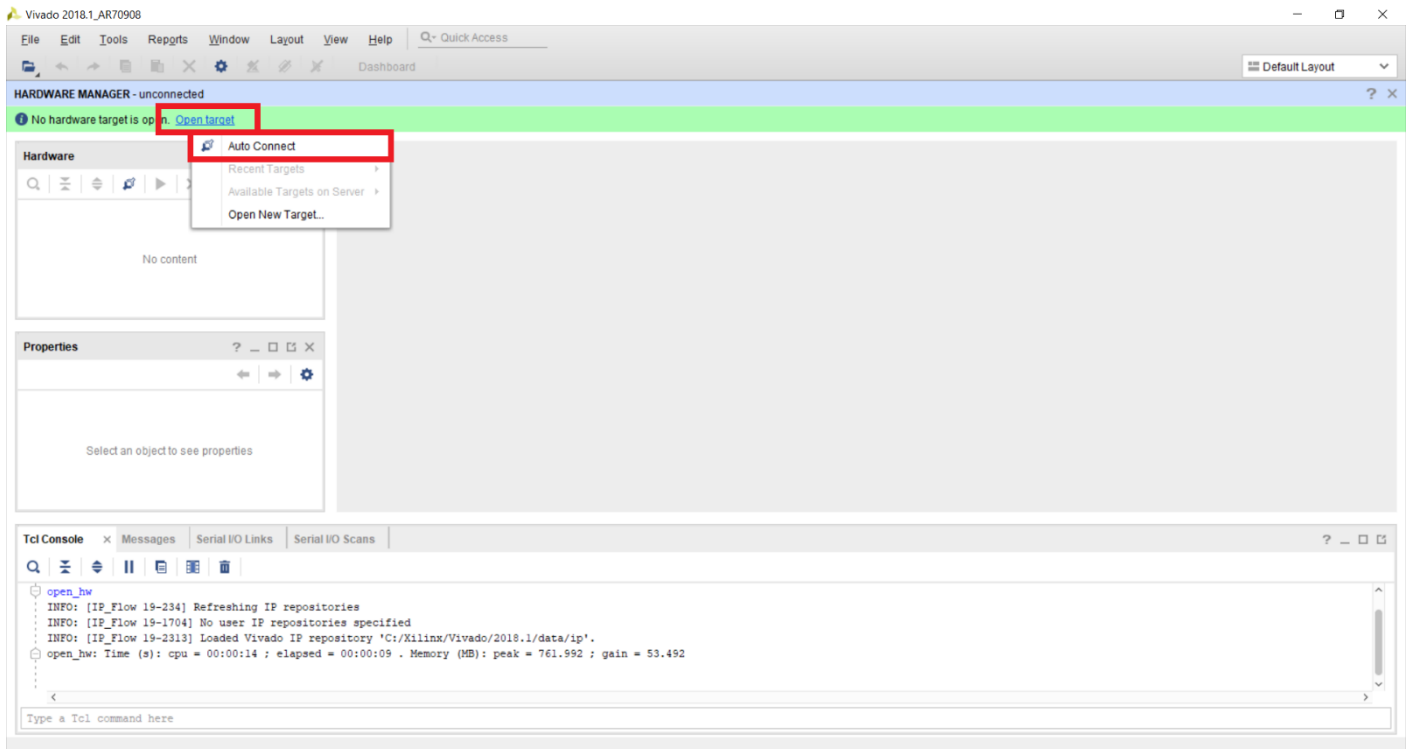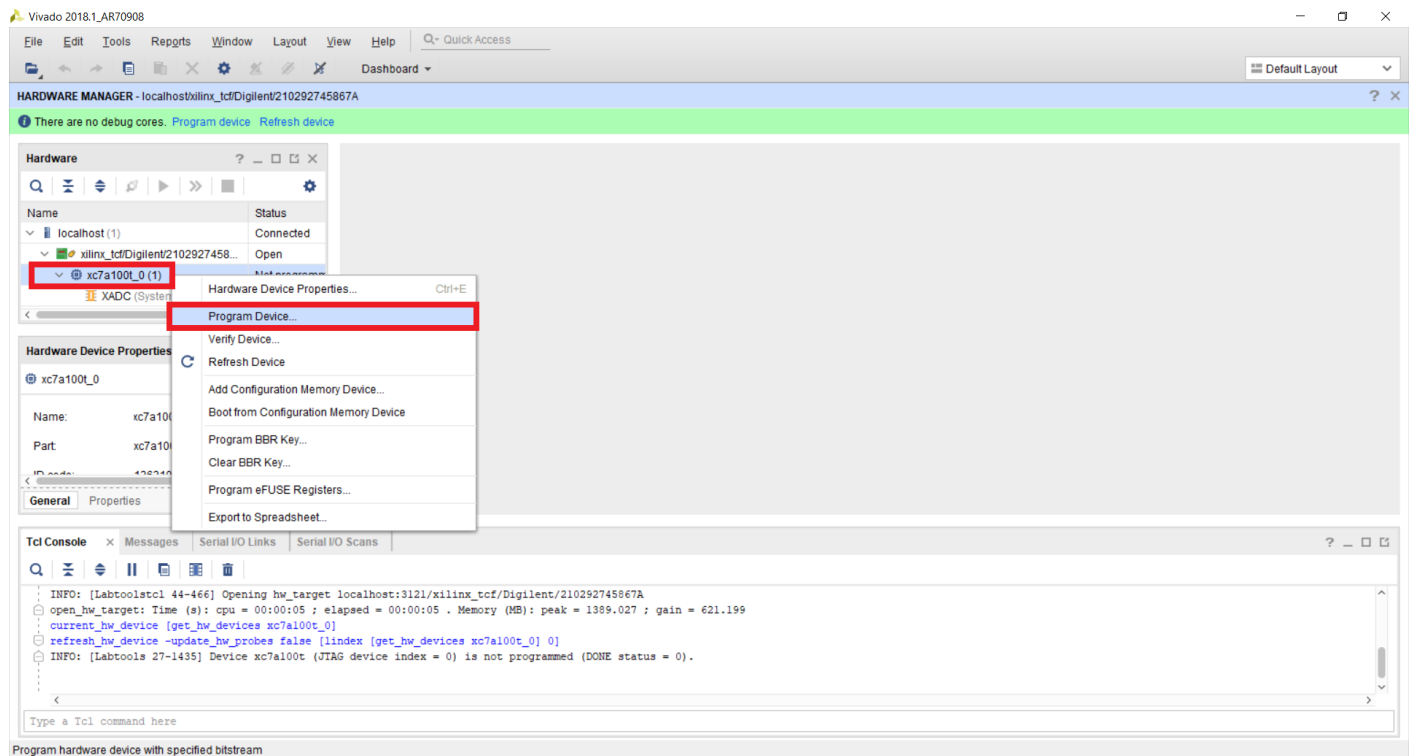
STEP 1

Open Vivado's Hardware Manager:

STEP 2

Connect the board to a computer via USB and to a monitor via VGA and turn it on. On Vivado click on "Open Target" and then "Auto Connect":
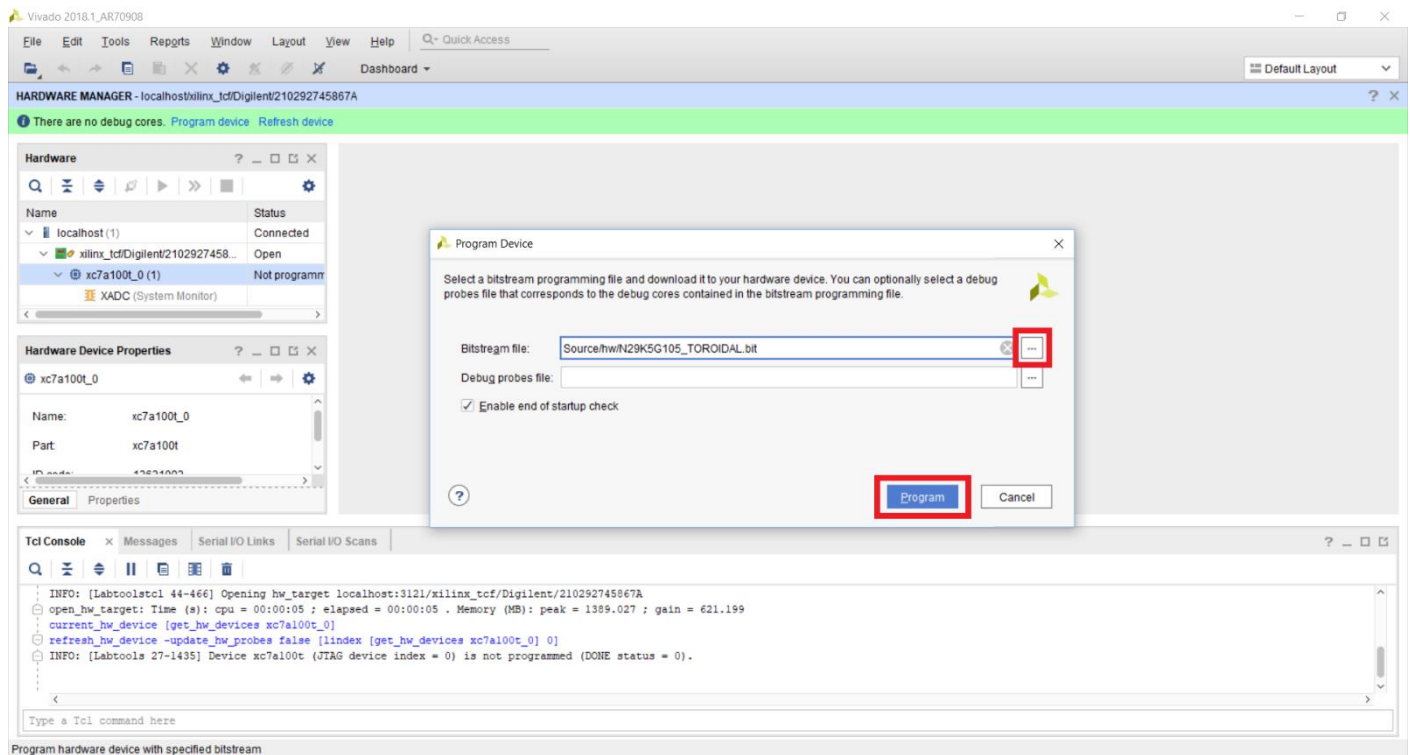
STEP 3

Once Vivado recognizes the board, right-click on the FPGA and then click on "Program Device":
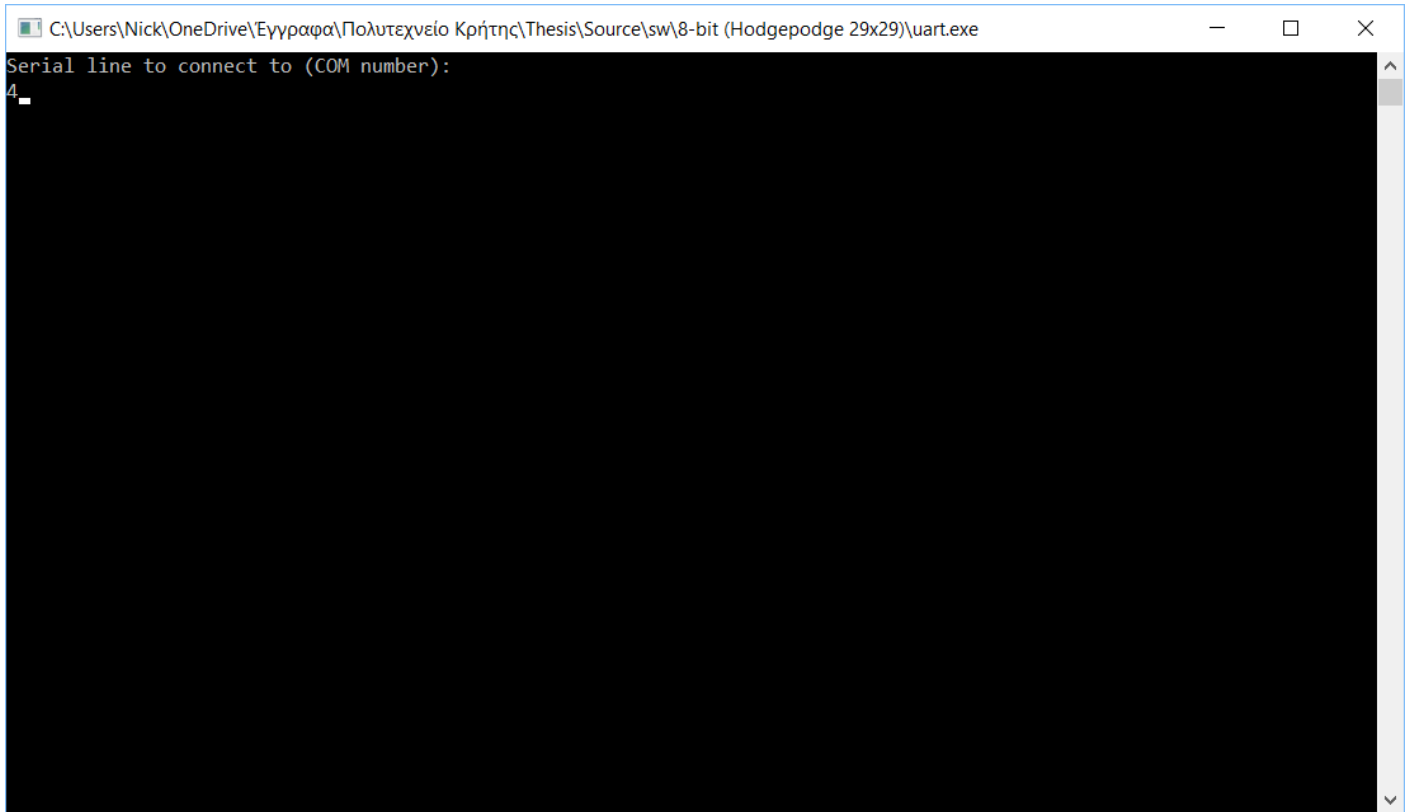
STEP 4

In order to program the device, we need to choose a compatible bitstream. The bitstream files are located in the directory *Source/hw* :

Note: N29K5G105 corresponds to the *Hodgepodge Machine*, N29K16E1T5 to *Greenberg-Hastings*.
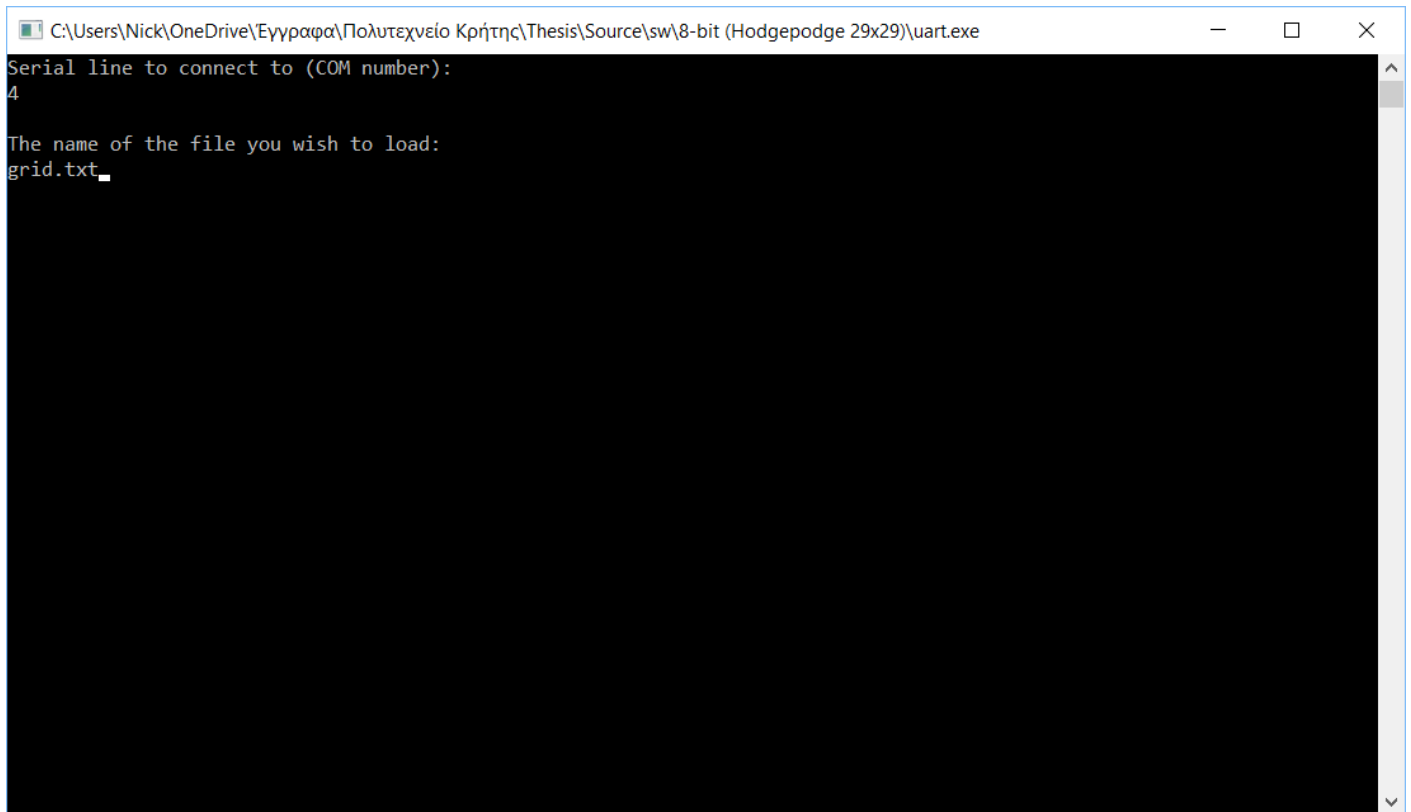
STEP 5

Once the bitstream is loaded onto the FPGA, we need to initialize the automaton with an initial state of the grid via UART. In the directory *Source / sw* you can find the software needed for any of the bitstream files located in the *hw* directory. Run *uart.exe* and insert the number of the COM port on which the board is connected:
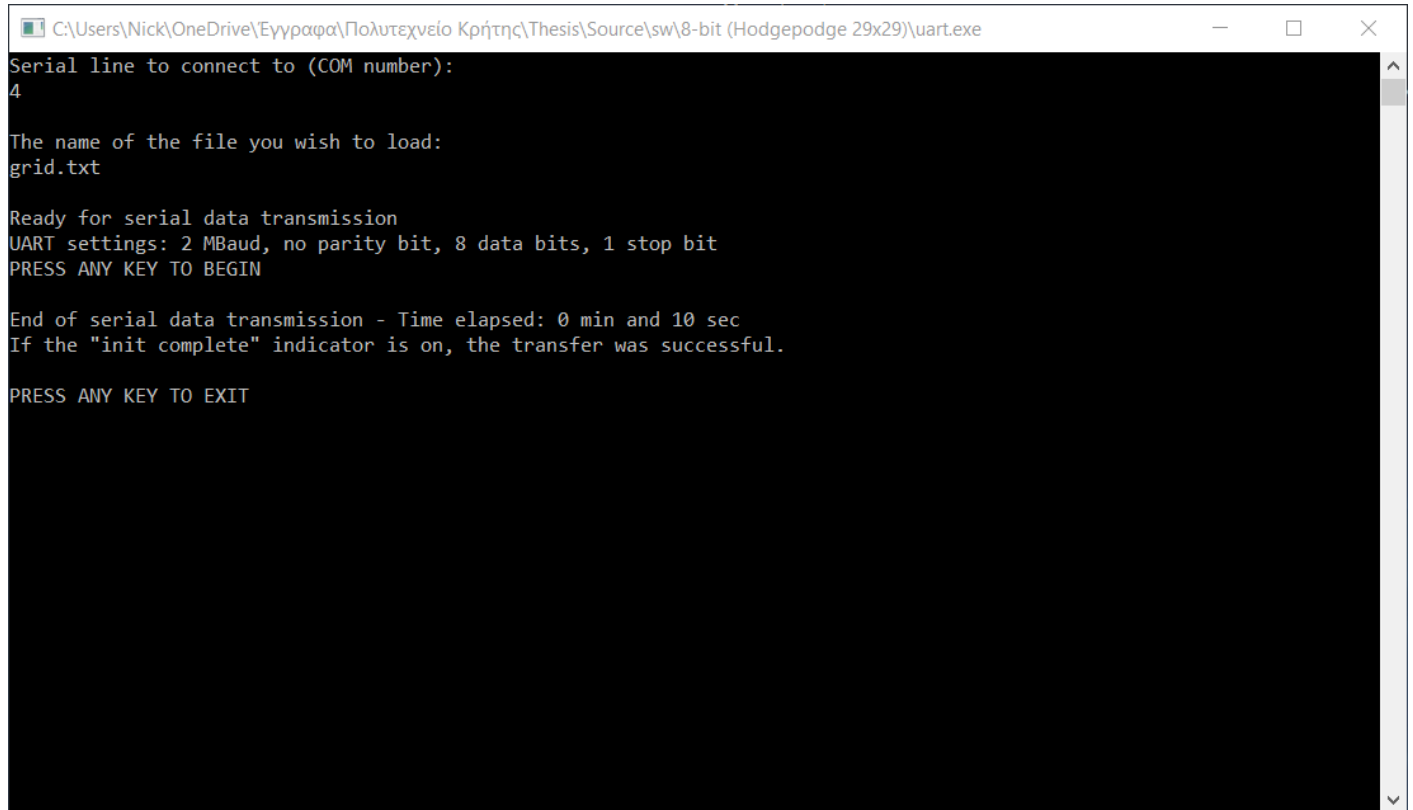
STEP 5

Then, enter the name of the TXT file you wish to load. Each txt file located in the *sw* directories contains the cell values for a different initial state of the grid.

STEP 6

Once the transmission is complete, the board starts displaying the automaton's evolution at 1 frame per second. You can press the board's "up" button for 60 frames per second (real-time display) and the "down" button to go back to 1 frame per second.


```
C:\Users\Nick\OneDrive\Έγγραφα\Πολυτεχνείο Κρήτης\Thesis\Source\sw\8-bit (Hodgepodge 29x29)\uart.exe        —    □    ✕
Serial line to connect to (COM number):
4

The name of the file you wish to load:
grid.txt

Ready for serial data transmission
UART settings: 2 MBaud, no parity bit, 8 data bits, 1 stop bit
PRESS ANY KEY TO BEGIN

End of serial data transmission - Time elapsed: 0 min and 10 sec
If the "init complete" indicator is on, the transfer was successful.

PRESS ANY KEY TO EXIT
```