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# USER MANUAL

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CSCI 6461



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## 1. Summary

This project works as a simulator of computer architecture.

We divide the CPU's component into two categories.

For one part, we call it Chip. Chip is the general term for all components that have operational capabilities. A chip can take one or more inputs and react in one or more outputs.

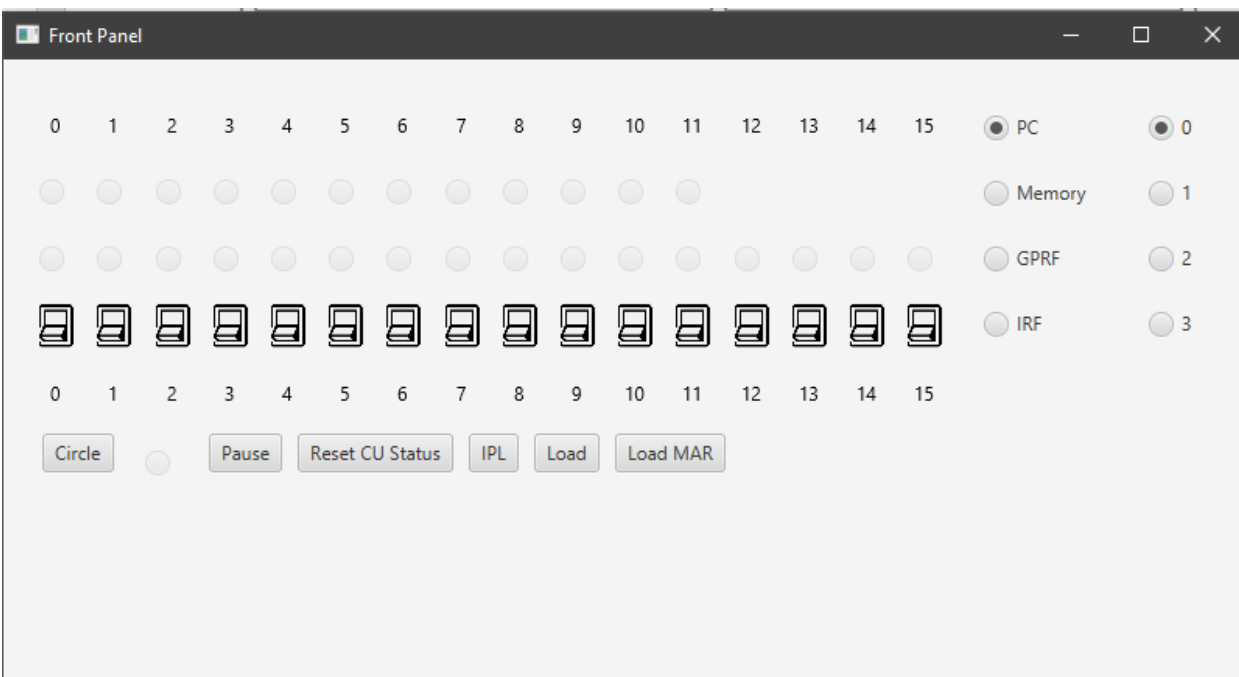
For the other one, we call it Cable. A cable is used to transmit data between chips.

We use these two parts to simulate the processor from the hardware level.

For the clock cycle, we designed two parts, "tick" and "evaluate." "Tick" is the clock rising edge, registers load the value when "tick" is coming. "Evaluate" is the time for "chip" operating. Chips change their outputs when evaluate.

## 2. User Interface

### 2.1 Front Panel



The front panel is used to put value into “chip” manually. It is what you see if you are using the computer system.

Front panel itself interacts the machine with some chips. We use some cables to connect it to our simulated machine.

The front panel has a total of 28 lights, divided into 2 lines, 12 and 16 lights a group respectively.

- 1) Above line (12 bits): the line with 12 lights is used to indicate the memory address register’s value.
- 2) Lower line (16 bits): the line with 16 lights shows the value of user’s choice.

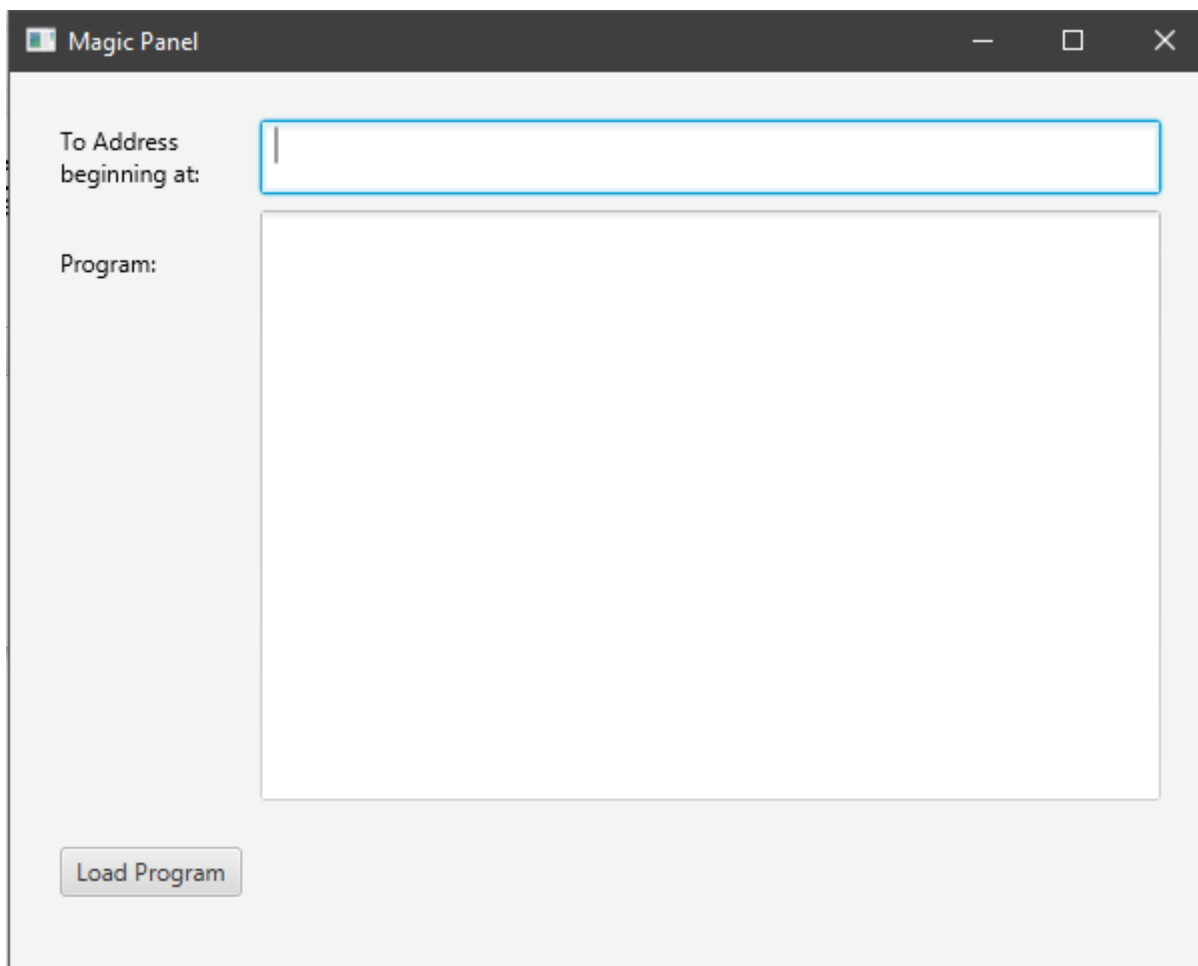
The Front panel has a total of 16 switches. All the switches are used to enter a value.

The front panel has several functions.

- 1) Circle: Clicking the Circle button makes the simulator run a complete period of a clock, which includes a “tick” and an “evaluate” process.

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- 2) Pause: The Pause button temporarily stops the simulator. When clicking the Pause button, the control unit pauses, and in the meantime, the pause light (bulb to the left of Pause button) goes on, and the Control Unit's Current Status in the debug panel turns to PAUSED. Tick and Circle have no functions at Pause status. Remember, loading a value by the front panel is possible only if the simulator is paused.
  - 3) Load: we can load the value to any of the registers or a certain point in the memory by the front panel. First set the value with the switches, then choose a destination with the switches to the right. Then click the load button to load the value to the destination. Again, you can only do this when the machine is paused.
  - 4) Load MAR: to load a value into the memory, you should set the MAR first. Clicking Load MAR button sets the MAR to the value decided by the switches.
  - 5) Reset CU Status: Clicking Reset CU Status button resets the CU Status to Initialized. This function changes no value in the simulator.
  - 6) IPL: Clicking the IPL button, which stands for Initialize Program Load, loads a testing program and sets PC to its entry point, by magic!

## 2.2 Magic Panel



Now the magic panel is used to load the document into the simulator.

The magic panel has 2 textboxes:

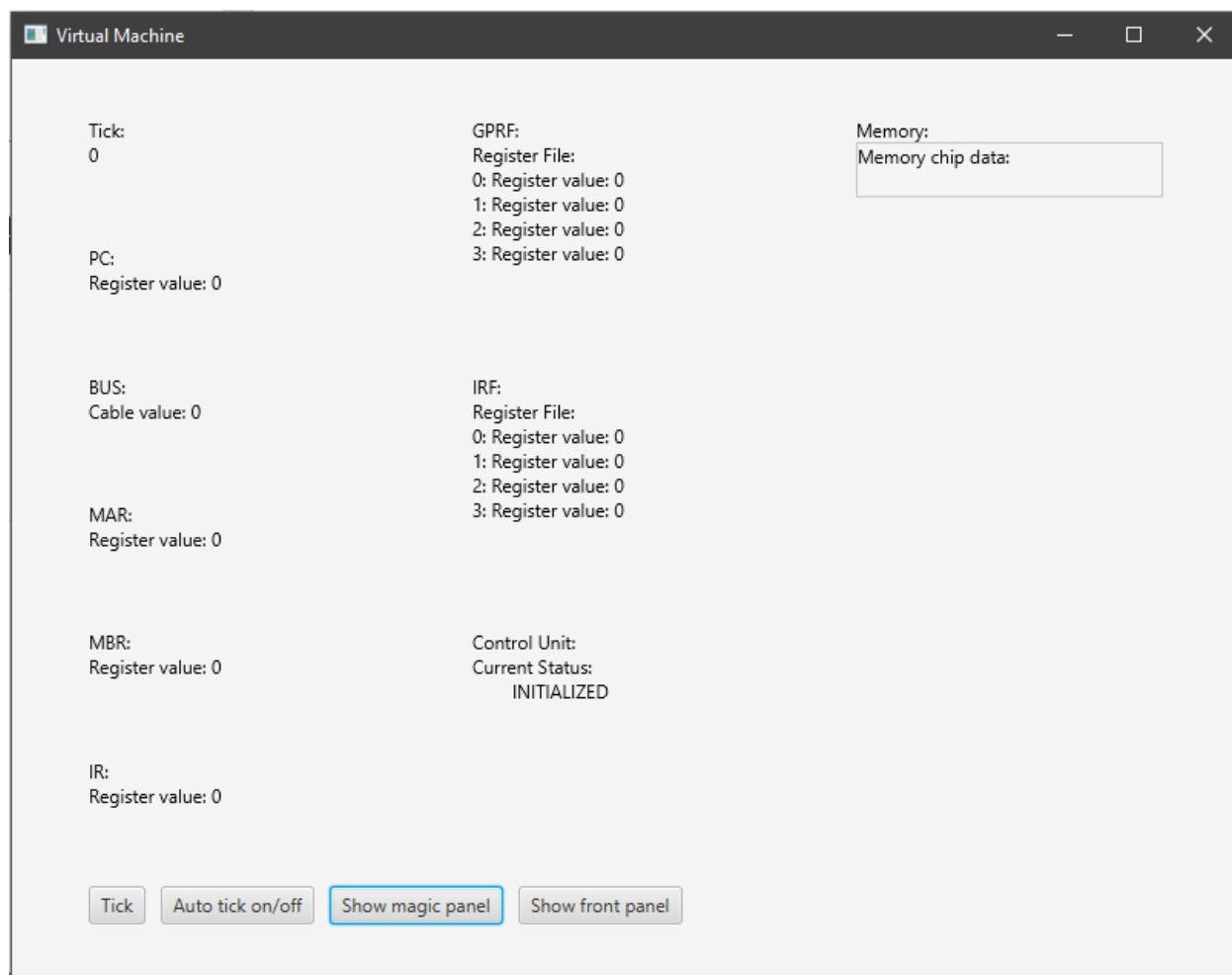
- 1) The text box - To Address beginning at, is used to set the beginning memory address.

- 2) The text box – Program, is used to put instructions.

Control panel has 1 button:

- 1) Load Program: Clicking the Load Program button loads the compiled program into the simulator's memory by magic. So you do not have to flip the switches on the front panel for hours.

## 2.3 Virtual Machine



We use the panel to show the internal state of the simulator.

This panel has 4 buttons.

- 1) Tick: Clicking the Tick button runs the simulator for a half circle, which is either a tick or an evaluate time. Please notice the difference between tick on debug panel and cycle on the front panel;
- 2) Auto tick on/off: Clicking Auto tick on/off button to turn on or off auto mode for running the simulator. Currently, one full cycle takes 2s;
- 3) Show magic panel: Clicking show control panel button opens the magic panel;
- 4) Show front panel: Clicking show front panel opens the front panel.

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### 3. Precautions

#### 3.1 LDX & STX

There are some ambiguous in the handling of LDX and STX instructions. When running LDX or STX, the IX part of the instruction indicates both destination and a part of EA. Our team chooses to handle it this way. The other possible explanation of these instructions is ignore IX when calculating EA.