

CPT203: Software Engineering 1
Week 6 Tutorial
State Machine Diagram

Question 1: Bank Account

Here is a bank account system. At first customer must open a bank account. The account is initially in "zero account" state, which simply mean the account is zero in balance. The account with non-zero balance is an account in "normal" state. There are several operations a user can performs such as deposit, withdrawal, and terminate account. When the account is in "zero account" state, only deposit function and terminate account function can be used. When the account is in "normal" state, only deposit and withdrawal functions can be used. If the customer terminate the account, it will goes into "Freeze" state which, will stay in frozen for 5 years before it is deleted from the bank system. Model the system using State Machine Diagram.

Question 2: Simple Door Sensor State Machine Diagram

The door sensor can be in one of three states: "Opened", "Closed" or "Locked". It can respond to the events Open, Close, Lock and Unlock. Notice that not all events are valid in all states; for example, if a door is opened, you cannot lock it until you closed it. Also notice that a state transition can have a guard condition attached: if the door is Opened, it can only respond to the Close event if the condition `doorWay->isEmpty` is fulfilled. The door sensor can be powered up only when the door is opened. It can be powered down only when the door is not locked. Model the system using State Machine Diagram.

Question 3: Toaster State Machine Diagram

Suppose you're designing a toaster. Create a State Machine Diagram that tracks the states of the toaster. Include necessary triggering events, actions, and guard conditions. First of all we must turn on the toaster. The toaster, when first turned on will enter the "Idle" state. You can put in a slice of bread when it is in "Idle" state, and press Start button to toast the bread. The toaster will response to the Start event only if a bread is present. When Start button is pressed, the toaster will turn into "Heating" state.

To prevent burning out the bread, the heater of the toaster must produce heat within a temperature range (upper and lower temperature limits). For this purpose, when the upper limit of the temperature is reached, the heater must stop heating and goes into the "Cooling" state. The cooling state resists until heater's temperature decreases to lower limit, and then it goes back to "Heating" state to heats up the heater again. The switching between "Heating" state and "Cooling" state goes on until the preset timer is up, then the bread is ejected and the toaster goes back to "Idle" state. When the toaster is heating or cooling, it will display a word, "Heating" or "Cooling" respectively on the LCD screen. In some event, the user may want to stop toasting and eject the bread prematurely. The user can stop the toast by pressing the Stop button anytime in the process of toasting, in that case, the toaster will cancel toasting and eject the bread, and go back to idle state. You can turn off the toaster when it is in "Idle" state. Model the system using State Machine Diagram.