Hangman Game Design Using Automata Theory

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Abstract

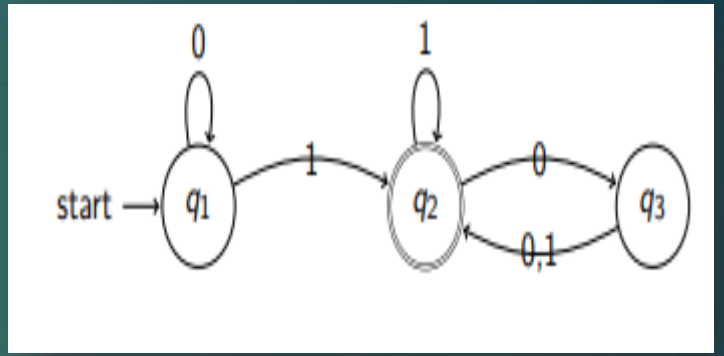
- Automata Theory plays an important role in various areas especially in game design. This presentation describes the concept of Automata theory in designing one of the most popular classical game which is Hangman. We studied and discussed the combination of automata and game theory that can be considered in order to design the game. As a result, we found that, Automata Theory is the fundamental access in designing and developing games.

Finite Automata

Definition:

A finite automata is a 5-tuple (Q, Σ, δ, q0, F) ,where

- Q is a finite set called the states
- Σ is a finite set called the alphabet
- $\delta : Q \times \Sigma \rightarrow Q$ is the transition function
- q0 is the start state
- $F \subseteq Q$ is the set of accept states



Automata Design For Hangman

Below is the description of our designed automata for Hangman Game. It is a Finite Automata with five tuples. The formal definition of the game stated as below.

Formal definition:

Let M = (Q, ∑, δ, q0, F)

M: Q = {Start Game, Choose Category, Guess Letter, DrawHangman, Win, Lose, End Game}

∑ = {sg, cg, ig, hi, hc, wc}

q0 = {Start Game}

F = {End Game}

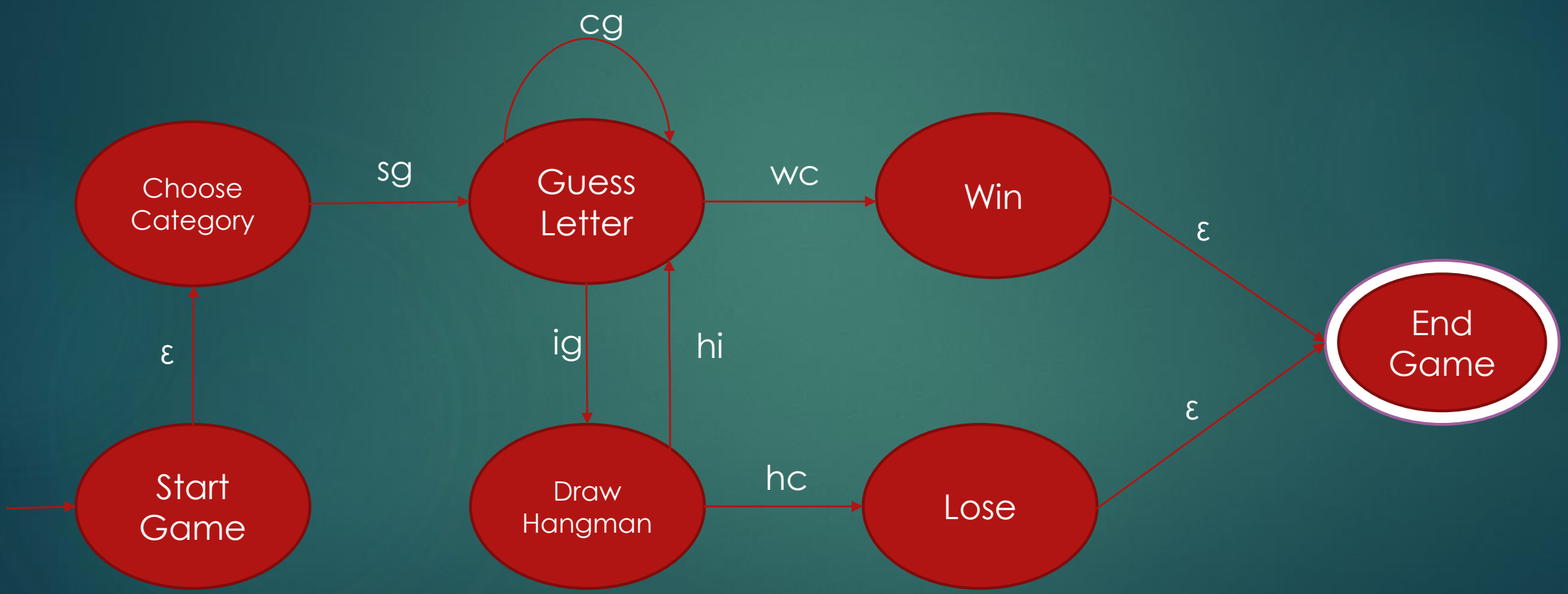
TRANSITION DESCRIPTION

Inputs, ∑	Description
sg	Game start
cg	Correct guess
ig	Incorrect guess
hi	Hangman incomplete
hc	Hangman complete
wc	Word Complete

δ	sg	cg	ig	hi	hc	wc	ε
Start Game (q0)	-	-	-	-	-	-	q1
Choose Category (q1)	q2	-	-	-	-	-	-
Guess Letter (q2)	-	q2	q3	-	-	q4	-
Draw Hangman (q3)	-	-	-	-	q2	q5	-
Win (q4)	-	-	-	-	-	-	q6
Lose (q5)	-	-	-	-	-	-	q6
End Game (q6)	-	-	-	-	-	-	-

TRANSITION TABLE FOR HANGMAN

State Machine



STATE DESCRIPTION

State (Q)	Description
Start Game	Idle state where the game start
Choose Category	The player will need to choose a category from a set of categories that the game provided. Once a category is chosen, a random word related with the category will be displayed for the player to guess
Guess Letter	Player enters a letter in order to guess the word given.
Draw Hangman	Hangman will be drawn starting from the head to its leg
Win	Word is correctly guess.
Lose	Word is incorrectly guess
End Game	State where the game ends

CONCLUSIONS

- In this study, we implemented the basic theory of automata in observing the flow of a game. We picked one game called Hangman to be the domain of our study. In the methodology ,we studied and described the logic of the game and how the game operates. We then designed the finite automata that matched to the concept of Hangman game for better understanding of the game flow as described in the methodology. As a whole, the implementation of automata theory plays an important role in developing a game software. Learning the automata theory will give better understanding on the underlying applications. We found that, understanding the fundamental of Computer Science theory is very important in becoming a good developer. Not only limited to game development, automata theory is very useful for applications with uncertainty. The concept of automata theory is simple in structure and can be implemented easily in software and hardware.

REFERENCES

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