ECSE 323 – Digital System Design
Rules Module
g39_rules

Description:

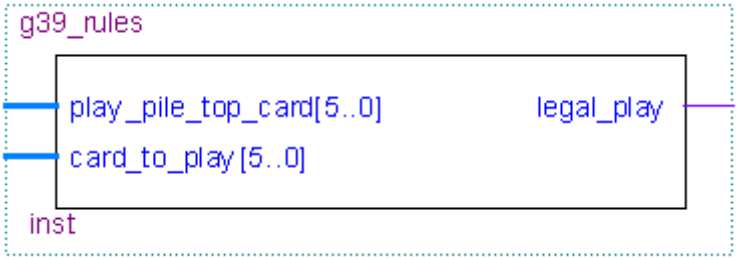
This circuit determines whether a given card is legal to play. This is determined according to the following four rules:

1. A card with a face_value of 8 is always legal to play.
2. A card is always legal to play on a card with a face value of 8.
3. A card can be play on a card of the same suit.
4. A card can be played on a card of the same face value.

The circuit has the following inputs/outputs:

play_pile_top_card: 6-bit input representing the value (V) of the top card of the play pile
card_to_play: 6-bit input representing the value (V) of a potential play

legal_play: 1-bit output representing whether "card_to_play " is a legal play.



Implementation Details:

Inputs “play_pile_top_card” and “card_to_play” are encoded in the form:
V = (face_value - 1) + (suit*13)

We determine their face values and suits as follows:

- face_value = Vmod13 + 1
- suit = floor(V/13)

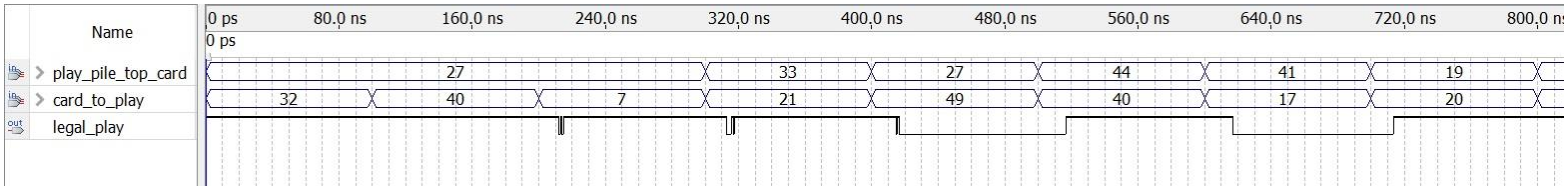
Where Vmod13 and floor(V/13) are determined using g39_Modulo_13 circuit described in lab 1.

The circuit was implemented in VHDL using process blocks and if statements’ technique to compare – according to the criteria mentioned above - the following 4 values:

- face value of “card_to_play”
- face value of “play_pile_top_card”
- suit of “card_to_play”
- suit of “play_pile_top_card”

Testing:

To ensure that the circuit is functioning correctly, we have run a simulation with all four possible legal moves.



Case 1: A card with a face_value of 8 is always legal to play.

- card_to_play is 7 → face_value = 8. So, legal_play = 1

Case 2: A card is always legal to play on a card with a face value of 8.

- play_pile_top_card is 33 → face_value = 8. So, legal_play = 1

Case 3: A card can be play on a card of the same suit.

- play_pile_top_card is 27 → face_value = 2, suit = 2
- card_to_play is 32 → face_value = 7, suit = 2
  So, legal_play = 1

Case 4: A card can be played on a card of the same face value.

- play_pile_top_card is 27 → face_value = 2, suit = 2
- card_to_play is 40 → face_value = 2, suit = 3
  So, legal_play = 1