

IC Design Project

Car Park Controller (CPC)

Design and implement a Car Park Controller in Verilog based on The HKU IC Design Flow:

Project Phase 1 (85%):

1. Create state diagrams of the design
2. Create a Verilog RTL (FSM) description of the design (for synthesis)
3. Create a complete testplan to verify the functions of the design
4. Create a Verilog testbench to implement the testplan
5. Perform functional verification using NC-Verilog and SimVision
6. Perform and analyze Code Coverage
7. **Demo and turn in phase 1 report before November 7, 2008**

Project Phase 2 (15%):

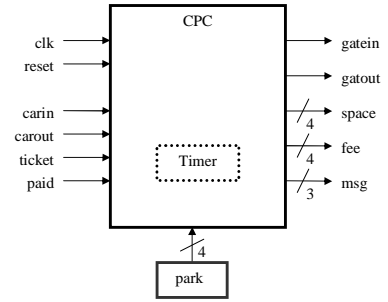
1. Modify the design to consist of no latch after synthesis
2. Define design environment and constraints for synthesis
3. Optimize the design for the fastest speed
4. Identify critical paths of the design
5. Analyze the design after synthesis
6. Perform gate-level functional (and timing) verification
7. **Demo and turn in phase 2 report before December 1, 2008**

Project Phase 3 (BONUS):

1. Create design top-level module
2. Create design IO file
3. Perform back-end physical design using SoC Encounter
4. Perform post-layout functional and timing simulation
5. **Demo before December 1, 2008**

Project Report (3 pages):

1. Design flow description
2. Results analysis
3. Comments and observations
4. Do not include any source code, waveform, simulation or synthesis output



Car Park Controller Input (IN)

CPC supports these basic input requests:

1. Detect a car coming in (carin)
2. Detect a car going out (carout)
3. Check parking ticket accepted (ticket)
4. Check parking fee paid (paid)
5. Check occupied parking space (park)

Car Park Controller Operation (OP)

CPC needs to perform these operations:

1. Display various car park messages (msg)
2. Open gate for car entry (gatein)
3. Open gate for car exit (gatout)
4. Handle available parking space (space)
5. Calculate parking fee (fee)

Car Park Controller Output (OUT)

CPC needs to produce these outputs:

1. Display various car park messages (msg)
2. Open gate for entry: gatein=1 when carin=1 and ticket=1 and space!=full
3. Open gate for exit: gatout=1 when carout=1 and paid=1
4. Determine available total parking space
5. Calculate parking fee:
 - A. fee=1 for the first 3 clk, then
 - B. fee=fee+1 for every 8 clk

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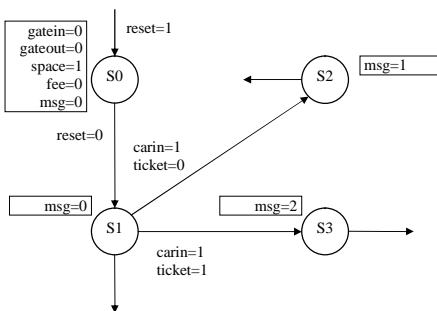
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Car Park Controller Message (msg)

CPC messages assignments:

0. Welcome to The HKU EEE Car Park
1. Please take the parking ticket
2. Please come in
3. Please pay your parking fee
4. Goodbye, please park longer and drive less to save the earth...
5. Sorry, Car Park is FULL, please turn off car ignition and wait...

Car Park Controller State Diagram (partial)



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