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Fabric Cutting Microcontroller Example

Requirements

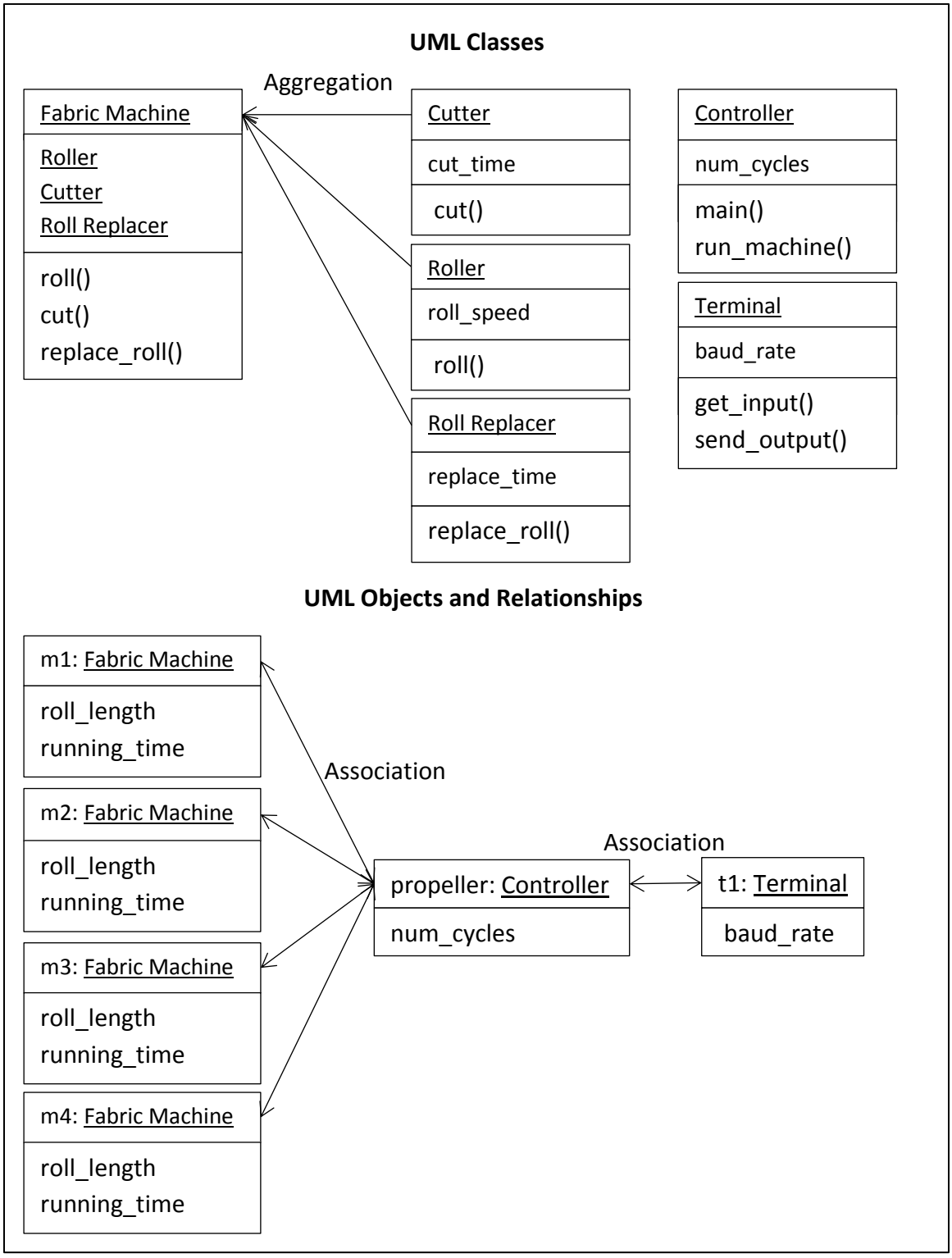
The requirements of the microcontroller are as follows:

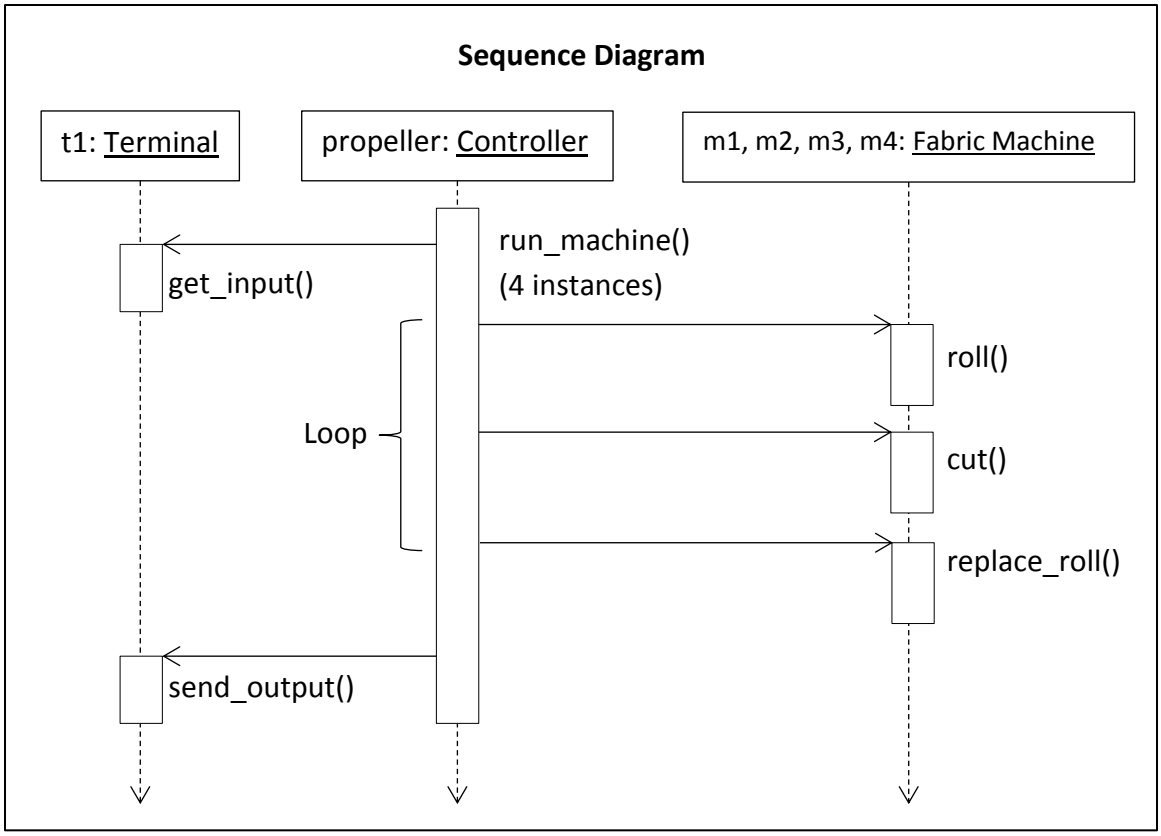
- **Purpose**: To emulate signals and event which occur in actual implementation of such devices
- **Inputs**: Length of fabric cuts and minimum running time for each of four machines
- **Outputs**: Signals to cutting, rolling, and roll-replacement mechanisms, and statistics at the conclusion of emulation including number of cuts made by each machine and the length of time each machine ran.
- **Functions**: Takes user input, signals rolling, cutting, and roll-replacement mechanisms, reports statistics when finished
- **Performance**: Controls up to eight separate machines at once
- **Manufacturing Cost**: $160 for Parallax's Propeller Professional Development Board and wires
- **Power**: 12V 1A maximum (Propeller board's power adaptor's maximum output)
- **Physical Size**: 9" x 5" x 1" (size of Propeller board)

Specifications

- Use Parallax's Propeller Professional Development Board.
- Create a generic function to control one machine and run four instances of this function to control all four machines at once.
- Emulate signals to rolling, cutting, and roll-replacement mechanisms using onboard LEDs.
- Handle user-readable input and output using Parallax Serial Terminal connection on computer.
- Use locks to ensure mutual exclusion between instances of the machine-controlling function access to terminal I/O.

Design


UML Classes
Aggregation
Fabric Machine
Roller
Cutter
Roll Replacer
roll()
cut()
replace_roll()
Cutter
cut_time
cut()
Roller
roll_speed
roll()
Roll Replacer
replace_time
replace_roll()
Controller
num_cycles
main()
run_machine()
Terminal
baud_rate
get_input()
send_output()
UML Objects and Relationships
m1: Fabric Machine
roll_length
running_time
m2: Fabric Machine
roll_length
running_time
m3: Fabric Machine
roll_length
running_time
m4: Fabric Machine
roll_length
running_time
Association
Association
propeller: Controller
num_cycles
t1: Terminal
baud_rate


Sequence Diagram
t1: Terminal
propeller: Controller
m1, m2, m3, m4: Fabric Machine
run_machine()
(4 instances)
get_input()
roll()
Loop
cut()
replace_roll()
send_output()