Concordia University

Department of Computer Science and Software Engineering

# SOEN 331 - S and U

# Formal Methods for Software Engineering

## Assignment 3

Extended Finite State Machines

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# 1 General information

**Date posted**: Monday 22 March, 2021.

**Date due**: Monday, 5 April, 2021, by 23:59.

**Weight**: 25% of the overall mark.

# 2 Introduction

This is a team assignment. Each team should designate a leader who will submit the assignment electronically. You must prepare all your solutions in LaTeX and produce a single `pdf` file. Please make sure you include all names and id's of all contributing team members as the authors. Name the file after your team, e.g. `team1.pdf`.

# 3 Ground rules

This is an assessment exercise. You may not seek any assistance while expecting to receive credit. **You must work strictly within your team and seek no assistance for this project (from the instructor, the teaching assistants, fellow classmates and other teams or external help)**. Please note that you should **not** discuss the assignment during tutorials. Failure to do so will result in penalties or no credit.

**All team members are expected to work relatively equally on each aspect of the problem**. The team leader has the responsibility to ensure that the team does not violate this rule. Failure to do so will result in penalties. In your submission, you must include only the names of those people who contributed to the assignment. Accommodating someone who did not contribute will result in penalties.

If there is any problem in the team (such as lack of contribution, etc.), the team leader must contact the instructor as soon as the problem appears.

# 4 System description

The system under consideration is a washing machine. Once the machine is on, it would automatically go into an operating mode after 10 seconds while blinking the operating light and producing a long beep sound.

As long as the machine remains in the operating mode it will maintain an operating light on. Upon reaching the operating mode the machine remains idle and expects a start signal to become active. If while active the power is out, then the machine goes into a stand-by mode, though it remains operational. It will automatically go back to being active once the power is back on. While active, one can cancel operation at which case the machine goes back to being idle. While idle, one can press a 'finish' button for the machine to complete its operating mode.

While idle the machine may receive a service signal in which case it goes into a servicing mode. A user should indicate that the machine is fixed, for the machine to go back being idle.

Upon the machine becoming active, it expects one to set the appropriate program. We allow one to enter a cancel button while setting the program, in order to reset the program and re-start. Once a program is set and provided that the door to the machine is closed, the machine locks the door and goes into a washing mode (which constitutes the main operation of the machine). Once this is done, the machine enters a rinse mode which lasts for 3 minutes and leads into a spin mode which lasts for 2 minutes. Upon completion of the spin, the machine unlocks the door. The completion of spin marks the completion of the active mode of the machine. The completion of the active mode brings the machine back to being idle while under the operating mode.

The machine has memory to keep track of its entire active operation. This is particularly important in the case where after a power outage the machine would go back to being active in which case it will remember to continue from the exact point it got interrupted from.

Upon initiating the washing mode, the machine reads in the current water temperature and compares it with the desired temperature which was has been set already as part of the program of operation. If the water temperature is not at the desired level, then the machine would wait 2 minutes and read the water temperature again. Once the water temperature reaches the desired level, then depending on the settings of the program, the machine would go into either a long cycle (which goes for 30 minutes) or to a short cycle (which goes for 10 minutes). The completion of either cycle marks the completion of the washing mode.

The machine can only be shut off while on. While shutting off, the machine will produce a beep sound.

# 5 Your assignment

You must produce an Extended Finite State Machine (EFSM) to capture the requirements of the system. Your EFSM should include (a) a mathematical representation and (b) a state transition diagram.

# 6 What to submit

Please submit your `pdf` file at the Electronic Assignment Submission portal

(`https://fis.encs.concordia.ca/eas`)

under **Theory Assignment 3**.

**END OF ASSIGNMENT**

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