

Exercise D – Real-time Architectures

In this exercise you have to develop a system architecture for an elevator. The elevator serves an N -story building. The system contains the following visible components.

- On each floor
 - two buttons on indicating the direction that a person wants to go
 - two corresponding lights that light up in response
 - a number, indicating the current position of the elevator
 - sliding doors
- The elevator cage
- The elevator control buttons, including an alarm
- The engine, controlling the cage movement

The system architecture involves both intelligent and ‘dumb’ components (see the slides). Be explicit about what information goes into the computer system (see the slides again for the internal representation of a terminal). The exercise includes the formalization of what we call the ‘normal’ behaviour of an elevator. Pay particular attention to safety matters (e.g., the doors cannot open while moving and vice versa; there must be feedback on what is actually happening etc.). Make timing requirements explicit. For example, in order to not miss a button-press the button state has to be observed frequent enough.

Once you have determined the system architecture, discuss the real-time tasks in this system. Remember that initially these are the complete responses to an event. Then decompose these to become more convenient. For each task, give also a criticality level (relative importance). Discuss schedulability matters and how you would combine this with the criticality.

Give pseudo code for the tasks and introduce variables for communication and synchronization. Discuss possible mappings to processes and threads.