

DIT635 - Finite State Verification Activity

Temporal Operators: A quick reference list.

- $G p$: p holds globally at every state on the path
- $F p$: p holds at some state on the path
- $X p$: p holds at the next (second) state on the path
- $p U q$: q holds at some state on the path and p holds at every state before the first state at which q holds.
- A : for all paths from a state, used in CTL as a modifier for the above properties ($AG p$)
- E : for some path from a state, used in CTL as a modifier for the above properties ($EF p$)

Consider a finite state model of a traffic-light controller similar to the one discussed in the homework, with a pedestrian crossing and a button to request right-of-way to cross the road.

State variables:

- **traffic_light**: {RED, YELLOW, GREEN}
- **pedestrian_light**: {WAIT, WALK, FLASH}
- **button**: {RESET, SET}

Initially: **traffic_light = RED, pedestrian_light = WAIT, button = RESET**

Transitions:

pedestrian_light:

- **WAIT** → **WALK** if **traffic_light = RED**
- **WAIT** → **WAIT** otherwise
- **WALK** → {**WALK, FLASH**}
- **FLASH** → {**FLASH, WAIT**}

traffic_light:

- **RED** → **GREEN** if **button = RESET**
- **RED** → **RED** otherwise
- **GREEN** → {**GREEN, YELLOW**} if **button = SET**
- **GREEN** → **GREEN** otherwise
- **YELLOW** → {**YELLOW, RED**}

button:

- **SET** → **RESET** if **pedestrian_light = WALK**
- **SET** → **SET** otherwise
- **RESET** → {**RESET, SET**} if **traffic_light = GREEN**
- **RESET** → **RESET** otherwise

1. Briefly describe a safety-property (nothing “bad” ever happens) for this model and formulate it in CTL.

2. Briefly describe a liveness-property (something “good” eventually happens) for this model and formulate it in LTL.