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<td>Fu, Zhe</td>
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Continuous High-speed Climbing Control and Leg Mechanism for Stair-climbing Vehicle

- Motivation
- What is the problem to address?

F1. Fire engulfed a high rise building.

F2. Stairwell is choked by toxic smoke, even lives of rescuers are endangered.

F3. RHex is used to detect survivors.

F4. Survivors are located and saved.

- Methodology
- How does it move?

The robot adopts a back-to-front wave gait when climbing stairs, and tripod gait during slow or fast multi-terrain traversing.

F5. Wave gait. Filled dots imply legs in stance, and empty dot imply legs in flight.

F6. Wave gait for climbing stairs.

F7. Tripod gait for traversing other terrains.

- Methodology
- Control algorithm

Each of the six legs is controlled by an actuator, with open-loop control. Touchdown detection is added to avoid de-synchronization of legs. If the motor current (below) exceeds threshold value, the motor is switched to stance mode, and vice versa.

\[ i_{motor} = \frac{V_{motor} - Emf}{R_a + R_{drive}} \]

F8. Formula to estimate motor current for touchdown detection.

F9. State Diagram for wave gait leg control

- Horizons
- What are for future work?

Onboard camera for finding fire-survivors are to be investigated. Real-time speech transport system is to be used to pick up survivors’ voice. These are the subject of ongoing and future work.