



# SLR Robot Documentation

Team Members

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## 1. Introduction

Meet SLR, a participant in the Fire Fighting Robots Contest geared toward simulated rescue missions. This robot is designed to ace three key tasks: collecting ping pong balls, extinguishing candles remotely, and navigating challenging terrains. These tasks mirror real-life rescue scenarios, showcasing SLR's prowess in emergency response robotics.

## 2. Design and Components

SLR comprises three essential components, each contributing to its versatility and functionality:

1. **Chassis:** The robust chassis serves as the sturdy foundation, hosting all crucial elements and featuring four mecanum wheels. This design ensures optimal maneuverability across diverse terrains, enabling SLR to navigate obstacles with ease.
2. **Arm:** Housing five degrees of freedom (5-DOF) through servo motors, the arm empowers SLR to execute intricate movements and accomplish tasks with precision. Its flexibility allows for effective handling of objects, vital for both collecting ping pong balls and extinguishing candles.

3. ***Computer (Brain):*** At the core of SLR's operations lies the Raspberry Pi 4 B+. This computer marvel, equipped with a Quad-core Cortex-A72 processor and 8GB RAM, efficiently manages signals and processes tasks. Despite its power, it consumes minimal energy, staying within the 500mA limit set for the contest.

Additionally, SLR's remote control is facilitated by a PS4 controller connected via Bluetooth, enabling seamless and intuitive operation from a distance. This combination of components grants SLR the agility, precision, and computational power necessary for success in the contest's challenges.

### **3. Task Accomplishments**

1. ***Collecting Ping Pong Balls:*** SLR adeptly mimics rescue operations by efficiently collecting ping pong balls, symbolizing the retrieval of stranded individuals. Its agile movement and precise arm control enable it to navigate and gather objects swiftly and effectively.

2. ***Extinguishing Candles:*** With precision akin to remote fire suppression, SLR swiftly extinguishes candles. The articulate movements of its servo-driven arm allow for accurate targeting and successful extinguishing, showcasing its potential in combating fires remotely.
3. ***Navigating Diverse Environments:*** SLR conquers environmental challenges with finesse. Negotiating hills, grass, and bumps, the robot's mecanum wheels and robust chassis ensure steady traversal through varied terrains, proving its adaptability in challenging conditions.

SLR's accomplishments in these tasks underscore its versatility and capability to emulate critical aspects of emergency response scenarios, making it a standout contender in the Fire Fighting Robots Contest.

## 4. Challenges Faced

SLR's journey in the Fire Fighting Robots Contest was not without its hurdles, presenting formidable challenges that demanded creative solutions:

1. ***Balance and Weight Distribution:*** A primary obstacle emerged in achieving the delicate balance between the robot's weight and the length of its arm. The inherent challenge lay in preventing tipping caused by the arm's movements, risking the robot's stability. Our solution was ingenious; we strategically mounted the arm at the chassis's midpoint. This placement ensured better weight distribution, enhancing stability and preventing tipping during arm movements.
2. ***Latency Issues with Camera:*** The aspiration to incorporate a computer vision algorithm for autonomous detection of fire (candles) encountered a significant setback due to latency between the camera and the Raspberry Pi. This delay hindered real-time processing, impeding our ability to implement the envisioned autonomous fire detection system.

Despite these challenges, the team's ingenuity and adaptability led to innovative solutions that mitigated hurdles and propelled SLR's performance in the contest.

## 5. Conclusion

In an exhilarating finale, Team **SLR** proudly secured 2nd place 🏅 in the 4th Fire Fighting Contest, outshining 17 other university teams. This remarkable achievement is a tribute to the team's unwavering dedication, meticulous planning, and seven months of relentless hard work.

Throughout this journey, overcoming challenges and refining strategies, SLR emerged as a symbol of innovation and resilience 🚀. The collaborative efforts of the team, coupled with innovative solutions to technical hurdles, propelled SLR to an outstanding performance, earning recognition among the top contenders in the contest.

The journey of Team SLR in the Fire Fighting Contest served as a testament to the power of teamwork, innovation, and perseverance, marking a chapter of success and excellence in the realm of intelligent systems engineering. 🌟

*Special Thanks to Team Members* 🌟

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