

Emergency Response: A Multi-Agent System

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Contents

| | | |
|----------|---|----------|
| 1 | Introduction | 2 |
| 2 | Crew Design and Implementation | 2 |
| 2.1 | General Design Principles | 2 |
| 2.2 | Emergency Services Crew | 2 |
| 2.2.1 | Design | 2 |
| 2.2.2 | Implementation | 2 |
| 2.3 | Firefighter Agent Crew | 3 |
| 2.3.1 | Design | 3 |
| 2.3.2 | Implementation | 3 |
| 2.4 | Medical Services Crew | 3 |
| 2.4.1 | Design | 3 |
| 2.4.2 | Implementation | 3 |
| 2.5 | Public Communication Crew | 3 |
| 2.5.1 | Design | 3 |
| 2.5.2 | Implementation | 3 |
| 3 | Crew Interactions and Flow | 3 |
| 3.1 | Interaction Design | 3 |
| 3.2 | CrewAI Flow | 3 |
| 3.3 | Justification of Design Choices | 3 |
| 4 | Testing | 3 |
| 4.1 | Unit Tests | 3 |
| 4.2 | Integration Tests | 3 |
| 4.3 | Results | 3 |
| 5 | Conclusion | 3 |
| 6 | References | 3 |

1 Introduction

This report presents the final implementation and results of our multi-agent system (MAS) for emergency response coordination. Building upon our previous designs from Tasks 1 and 2, we have developed a complete, functional system that demonstrates the effectiveness of agent-based approaches in managing complex emergency scenarios.

The system is implemented using CrewAI, a framework that enables the creation and coordination of specialized agent crews. Each crew is designed with specific responsibilities and operates through well-defined processes, ensuring efficient handling of emergency situations. The implementation includes:

- **Emergency Services Crew:** Handles initial emergency assessment and coordination
- **Firefighter Agent Crew:** Manages firefighting resources and operations
- **Medical Services Crew:** Coordinates medical response and hospital resources
- **Public Communication Crew:** Manages public information and communication

Report Structure:

- Section 2 details the design and implementation of each crew, including their process definitions and data models
- Section 3 explains the interaction mechanisms between crews and the overall system flow
- Section ?? presents the results of system testing and validation
- Section 5 concludes with insights and potential future improvements

The implementation builds upon our previous design while introducing several refinements based on practical considerations and testing results. These modifications are documented and justified throughout the report. The complete source code, along with setup instructions and required input files, is provided in the accompanying project repository.

2 Crew Design and Implementation

2.1 General Design Principles

A design overview of the system.

2.2 Emergency Services Crew

2.2.1 Design

Purpose The Emergency Services crew is responsible for the initial assessment of the emergency situation and the dispatch of the appropriate response teams.

Changes In the initial design, the emergency services crew was responsible for directly notifying the other crews and generating separate assessments for the firefighters crew and the medical services crew, but we chose to instead generate a single call assessment, which includes the evaluation of whether firefighters and medical services are required. This assessment is then programmetically used by the flow to call the subsequent crews.

2.2.2 Implementation

Emergency Call Agent An explanation of the code.

```
1 demo code
```

Notification Agent An explanation of the code.

```
1 demo code
```

2.3 Firefighter Agent Crew

2.3.1 Design

2.3.2 Implementation

2.4 Medical Services Crew

2.4.1 Design

2.4.2 Implementation

2.5 Public Communication Crew

2.5.1 Design

2.5.2 Implementation

3 Crew Interactions and Flow

3.1 Interaction Design

3.2 CrewAI Flow

3.3 Justification of Design Choices

4 Testing

4.1 Unit Tests

4.2 Integration Tests

4.3 Results

5 Conclusion

6 References