

Emergency Filtering/Evacuation/Response MAS

Title: **Multi-Agent System for Emergency Management in a City or Comune**

Objective

This Multi agent System follows **GAIA methodology** in order to implement a Decentralized Emergency Filtering and Evacuation Response System using **DALI**.

Documentation:

1.1 Roles

Role	Main Responsibilities
Sensor	Detects ALL anomalies, filters out the Emergency ones (earthquake, fire, smoke), sending out either an alarm or a false-alarm.
Coordinator	Coordinates between the other agents, immediately evacuates, requests equipment from the manager, dispatches the responder with the proper equipment.
Evacuator	evacuates people from the affected location.
Manager	Evaluates and dispatches the proper equipment for the emergency type.
Responder	uses the equipment to counteract and remedy the emergency at the affected location.
Logger	Records all events, actions, and system status.
Communicator	sends mass alarms to citizens
Person	receives a copy of the mass alarms.

1.2 Virtual Organization

- **Name:** `EmergencyFilteringEvacuationResponse`
- **Goals:**
 - Minimize risks to people and infrastructure.
 - Ensure prompt and coordinated reaction to emergencies.
 - Support distributed decision-making among agents.
- **Roles and Interactions:**
 - `Sensor` → `Coordinator`: sends alarm messages.
 - `Coordinator` → `Communicator`: sends mass alarm.
 - `Communicator` → `Person`: sends a copy of the mass alarm.
 - `Coordinator` → `Evacuator`: sends evacuation commands.
 - `Coordinator` → `Manager`: requests equipment.
 - `Manager` → `Coordinator`: dispatches equipment.

- `Coordinator` → `Responder`: sends emergency response command.
- `Sensor/Coordinator/Manager/Evacuator/Responder` → `Logger`: record of all relevant events and actions.

1.3 Event Table

Sensor

Event	Type	Source
<code>sense(X)</code>	external	environment
<code>alarms(X)</code>	internal	state
<code>falarms(X)</code>	internal	state

Coordinator

Event	Type	Source
<code>alarm(X)</code>	external	Sensor
<code>equipped(E)</code>	external	Manager
<code>evacuated(L)</code>	external	Evacuator
<code>responded(L)</code>	external	Responder
<code>response(E, L)</code>	internal	state
<code>done(L)</code>	internal	state

Evacuator

Event	Type	Source
<code>evacuate(X)</code>	external	Coordinator

Responder

Event	Type	Source
<code>respond(L)</code>	external	Coordinator

Manager

Event	Type	Source
<code>emergency(E)</code>	external	Coordinator
<code>dispense(E)</code>	internal	state

Logger

Event	Type	Source
<code>generic(E, L)</code>	external	agents
<code>alarm(E, L)</code>	external	agents
<code>falarm(E, L)</code>	external	agents
<code>message(X)</code>	external	agents

Communicator

Event	Type	Source
<code>communicate(Targets, Content)</code>	external	Coordinator

Person

Event	Type	Source
<code>message(Content)</code>	external	Communicator

1.4 Action Table

Sensor

Action	Description
<code>log(X)</code>	sends events to the Logger

Coordinator

Action	Description
<code>equip(X)</code>	sends equipment request to the Manager
<code>evacuate(X)</code>	sends evacuation command to the Evacuator
<code>log(X)</code>	sends events to the Logger

Evacuator

Action	Description
<code>log(X)</code>	sends events to the Logger

Manager

Action	Description
<code>log (X)</code>	sends events to the Logger

Responder

Action	Description
<code>log (X)</code>	sends events to the Logger

Communicator

Action	Description
<code>contact (Target, Content)</code>	sends Content to a Target of type Person

1.5 Agent Behaviors

- **Sensor:** Proactive; generates states upon detecting anomalies, filters out alarms from false and informs the coordinator, and Proactive for its use of internal states and events.
- **Coordinator:** reactive to incoming alarms; proactive in managing the response strategy according to incoming equipment, also proactive in manageing its states until it achieve equilibrium (internal event done), and Proactive for its use of internal states and events.
- **Evacuator:** reactive to evacuation commands; can report issues or confirmation.
- **Manager:** Proactive by evaluating which equipment belongs to which emergency response, and its use of internal states and events.
- **Responder:** reactive to response commands; can report issues or confirmation.
- **Logger:** reactive; logs every received message or command.
- **Communicator:** hybrid reactive/proactive; receives a list of targets and a message content and maps that content to a message to be mass sent to all targets.
- **Person:** reactive; receives a copy of the mass message content.