

GOR BDI Behaviours

31 July 2018 @ EMV

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Behaviours Workshop June 2018 | Notes (1 of 3)

- Doesn't have to be too hot (late 20s) to be a problem for fires; can still get chaotic.
- Sounds (helicopters, sirens) also influence people.
- **Abandoned cars can cause traffic problems.** Could test with scenarios focussed on pinch points as well as generated with some probability in smoke front.
- Inverse law of radiation useful for how far back from the fire front must one be to be "safe" say in a last resort oval. Many measures exist for calculating damage based on distance to fire, radiation, etc.
- Highest cause of death are (1) hyperthermia (2) congested airways (3) accidents.
- **Last resort should include "go back home".**

Behaviours Workshop June 2018 | Notes (2 of 3)

- Day visitors: should we include foreign visitors? Some are determined to do sightseeing against odds.
- **Stay Home, Shelter Last Resort, might need to be included as states (intent) to report against.**
- **Max three attempts to reroute, and probability decreases with each.**
- **A small percentage of people will drive towards smoke to see what is going on.**
- **`Going to shops` not part of activities, just going to check on dependents is enough.**
- **Add to percepts: awareness of weather, like "code red".**
- **People not in the area might not perceive threat to home at all, until say neighbours call.**

Behaviours Workshop June 2018 | Notes (3 of 3)

- Smoke > Fire > Neighbours leaving, in terms of ranking; messages received will have different ratings; **give points for each percept then react when threshold is breached.**
- **Individuals should have different thresholds of reaction to capture diversity.**
- **Permanent+Part-time Residents:** more likely to be aware of danger and plan; most will have a plan to leave; not require too many cues or delay too much; some will be elsewhere and come home; those close to interface to fire are more likely to be prepared; most people that stay are staying to defend.
- **Regular Visitor:** will defend with low probability only. Different from resident in terms of where they go: less likely to go to place of congregation; more likely to go home;
- **Day+Overnight** visitors to incorporate ones who are determined to sightsee.

Behaviour | Groups (Revised)

Resident: lives in the region; has local knowledge of roads and places of congregation; is connected to the community; is likely to have a concern for others, pets, and property; most likely to defend property.

Part-time Resident: owns property in the region, but may only live there for several months of the year. is less familiar with the area, but does not have a large community network; less likely to be prepared for a bushfire threat; and less likely to defend property.

Regular Visitor: has visited the region on several occasions; may have a holiday home in the region. Will know the area a bit, but is not likely to have concerns for pets or relatives. Very unlikely to stay and defend property.

Overnight Visitor: is unfamiliar with the area; living in short term accommodation; will not defend property; likely to gather belongings then follow instructions or leave the region.

Day Visitor: is mostly unfamiliar with local roads and places of congregation, will either ignore fire alert or leave region.

Behaviour | Descriptive states (Revised)

Routine: people going about their daily lives unaware (generated MATSim plans)

Prepare: people who have acknowledged the threat, but have not committed to evacuating yet (optional state)

Evacuate: people who have committed to evacuating

Safe: people who now consider themselves as being safe

Stay: those deciding not to evacuate

Shelter: those sheltered in last resort places (could be home)

Out of options: people who have no other (programmed) options left to try

Behaviour | Situation awareness (Revised)

- Can see **smoke** and **fire** (proximity to front)
- Is aware of the **weather** (e.g., code red)
- Receives **emergency messages** (advice, watch&act, evacuate); receives messages from friends (**social network**)
- Perceives **road blockages** and closures and **accidents**
- Observes **congestion** on roads
- Perceives **people nearby leaving**

Behaviour | Activities (Revised)

- **Return to accommodation:** e.g., if a resident was at work, or regular visitor at shops.
- ~~**Go to shops** to stock up: if deciding to stay, or just preparing.~~
- **Visit / collect dependents:** e.g., an elderly relative, or farm animals (horses).
- **Evacuate to safe node;** e.g., based on knowledge, or as instructed by message; could be to area outside of threat or within (place of congregation).
- Continue with daily **routine activities**.

BDI Behaviour Model

(Background slides: BDI Cognitive Model for Social Simulations, Feb 2018)

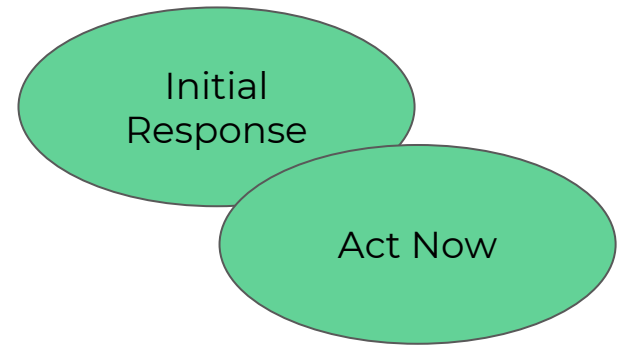
Response Threshold Model

Agents perceive the unfolding situation over time through messages (**transmitted alerts**) and by sensing events around them (**environmental alerts**). Each will contribute a fixed value to the agent's response barometers.

Values for each alert will be determined using a ranking scale ranging from 1 to 5 in severity.

Alerts of the same type will not have a cumulative effect, but a transmitted alert can combine with an environmental alert to increase the likelihood of acting. An agent will store the highest (most severe) value they receive for each type of alert.

Once the combined value crosses a personal threshold, it will trigger a response. Agents will be given two threshold values which dictate when they begin responding to the threat (**INIT**) and when they decide to leave (**ACT**). These will be between 1 and 10, with $INIT \leq ACT$.



TRANSMITTED ALERTS	VALUE
Advice message	1
Watch & Act message	2
Evacuate Now message	3
ENVIRONMENTAL ALERTS	VALUE
Smoke visual	3
Fire visual	4
Neighbours leaving	5

Response Threshold Model | Example

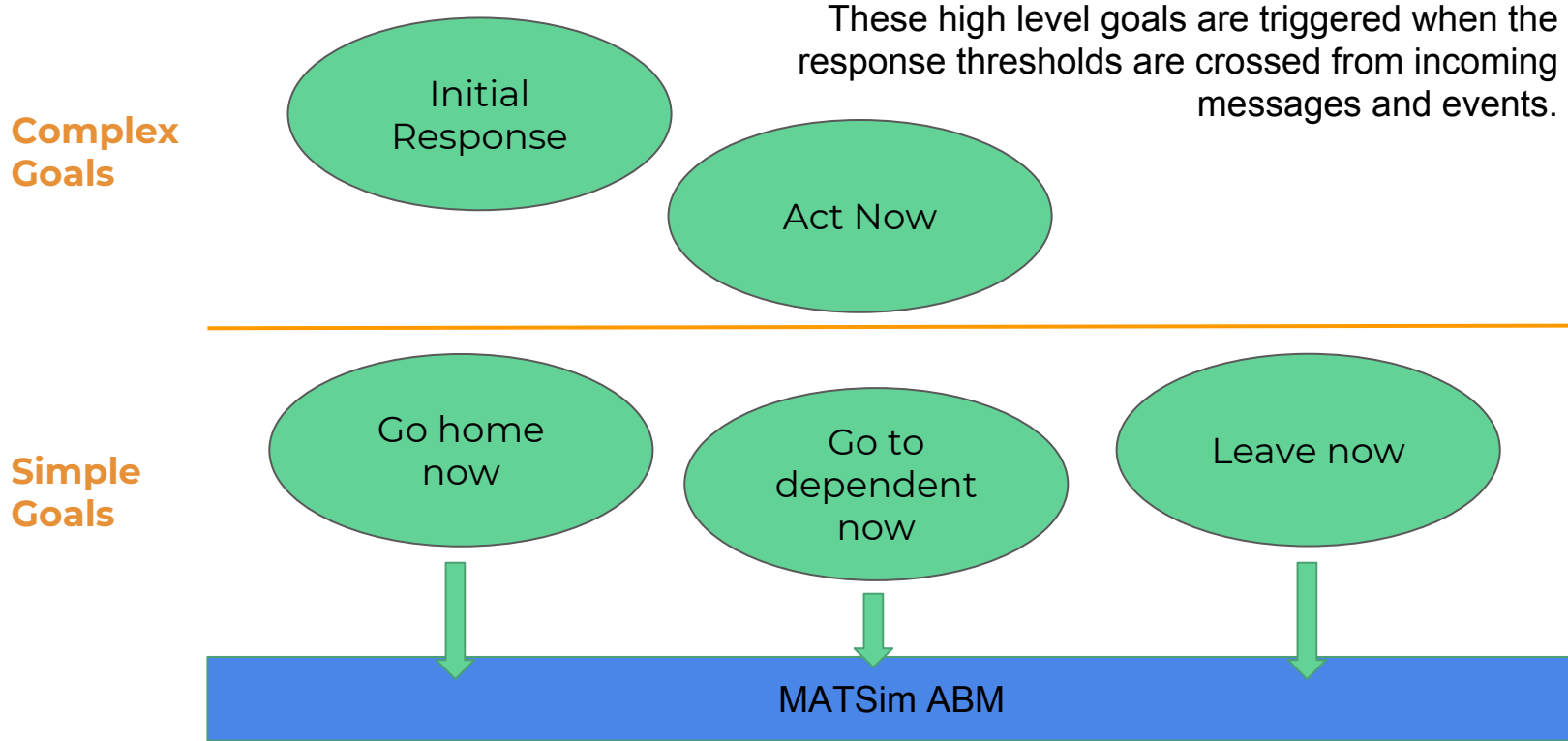
Suppose an agent has thresholds **INIT**=4 and **ACT**=7.

Label the stored barometers **T** and **E**. Initially, these will both be 0.

Begin simulation

- Agent receives “Watch and Act” message, and so **T**=2. **T+E = 2 < INIT** so the agent will continue with their daily plan.
- Agent receives “Evacuate Now” message, so **T**=3. **(T+E) = 3 < INIT** so the agent will continue with their daily plan.
- Agent receives “Smoke visual” percept, so **E**=3. **INIT < (T+E) = 6 < ACT** so the agent will respond to fire, but not yet leave.
- Agent receives “Neighbours leaving” percept, so **E**=5. **ACT < (T+E) = 8** so the agent will act to remove themselves from the fire threat.

Behaviour Model



Resident | Initial Response

Possible variations in preparation behaviour:

R1 has no dependents and goes home to prepare.

R2 has dependents but goes home first, then collects dependents, then goes back home.

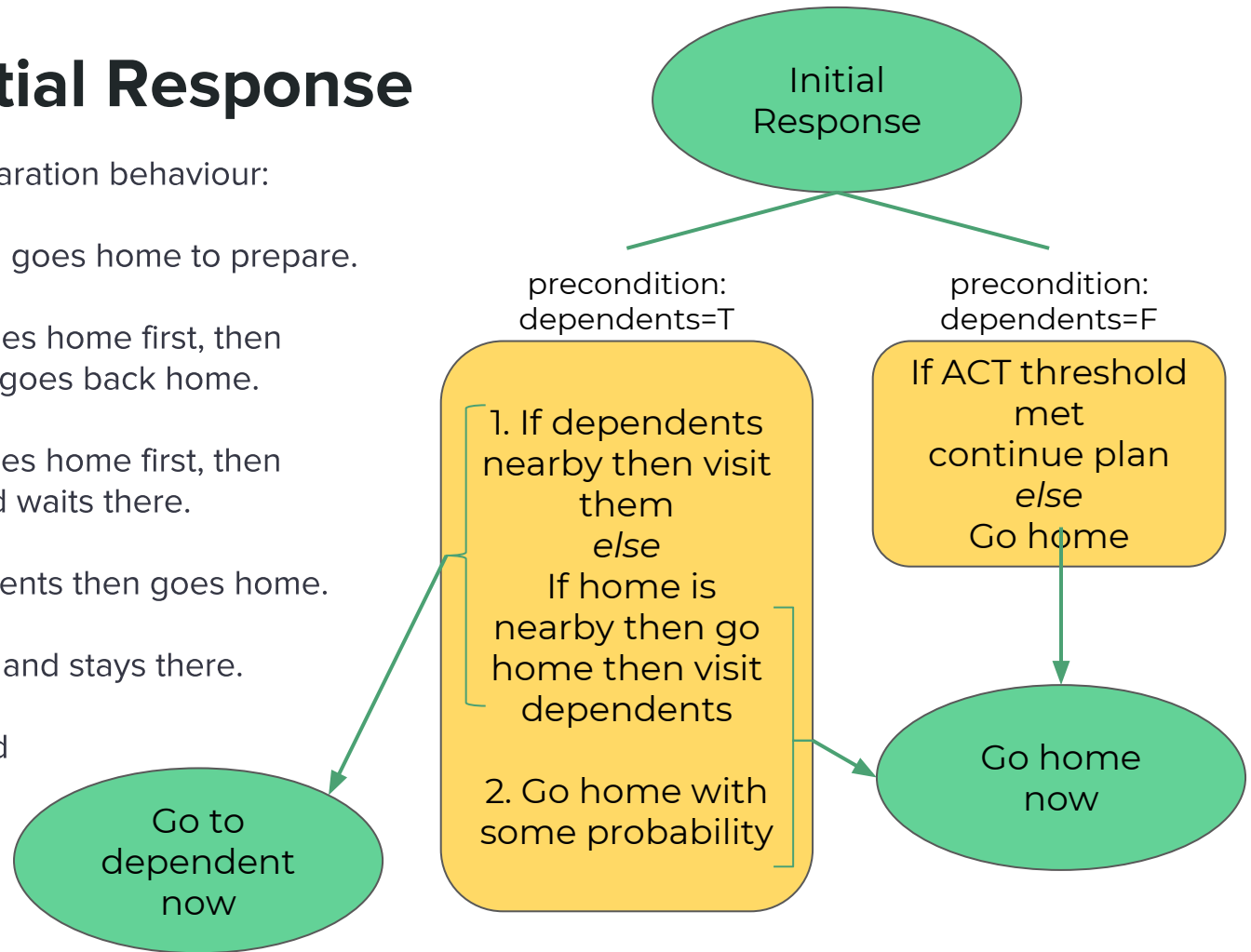
R3 has dependents but goes home first, then attends to dependents and waits there.

R4 goes to collect dependents then goes home.

R5 attends to dependents and stays there.

R6 has no dependents and continues working.

R7 has no dependents and continues shopping.



Resident | **Act Now**

Possible variations in behaviour:

R1 leaves from home.

R2 leaves from home with dependents.

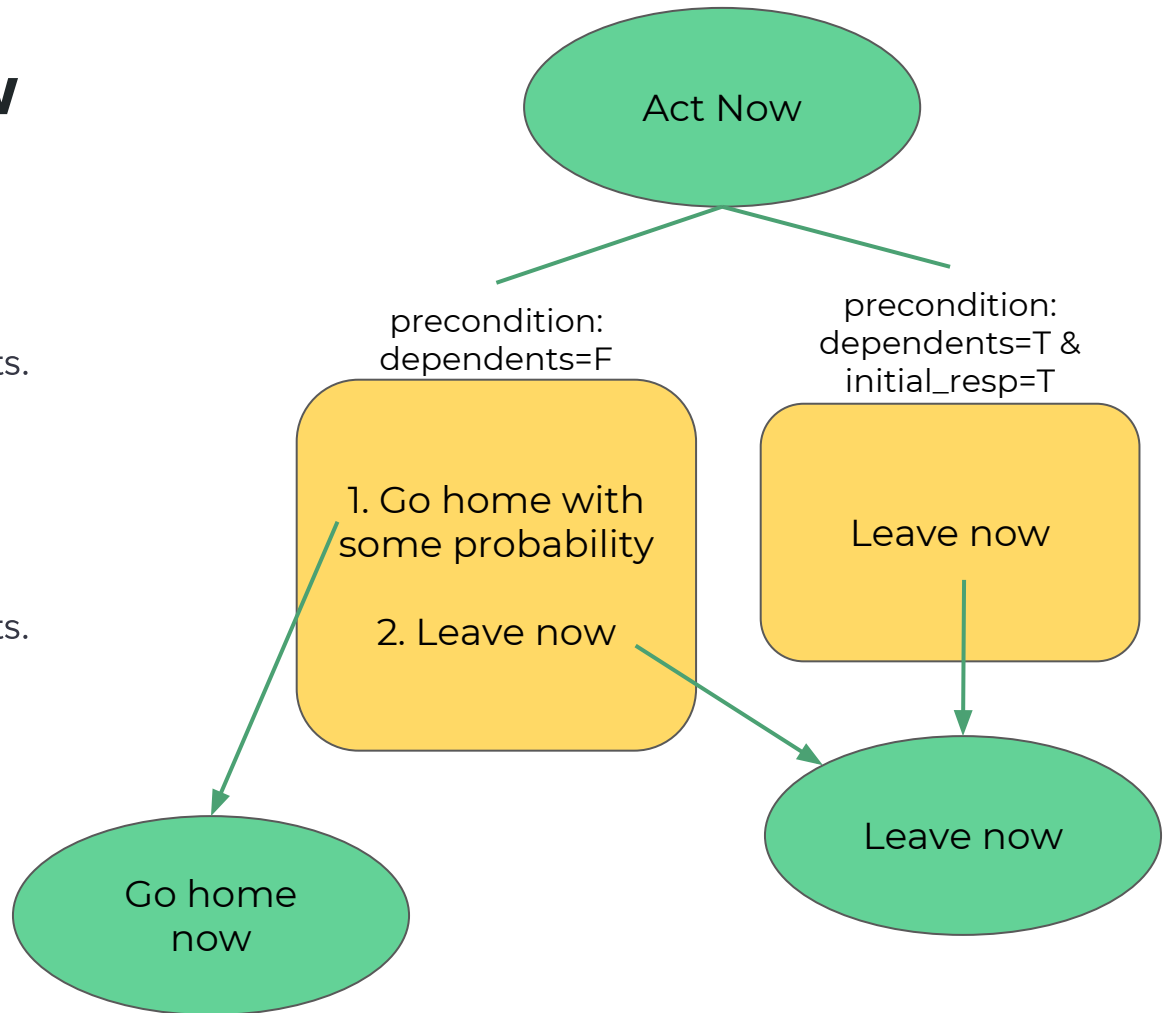
R3 leaves from dependent's location.

R4 leaves from home with dependents.

R5 leaves from dependent's location.

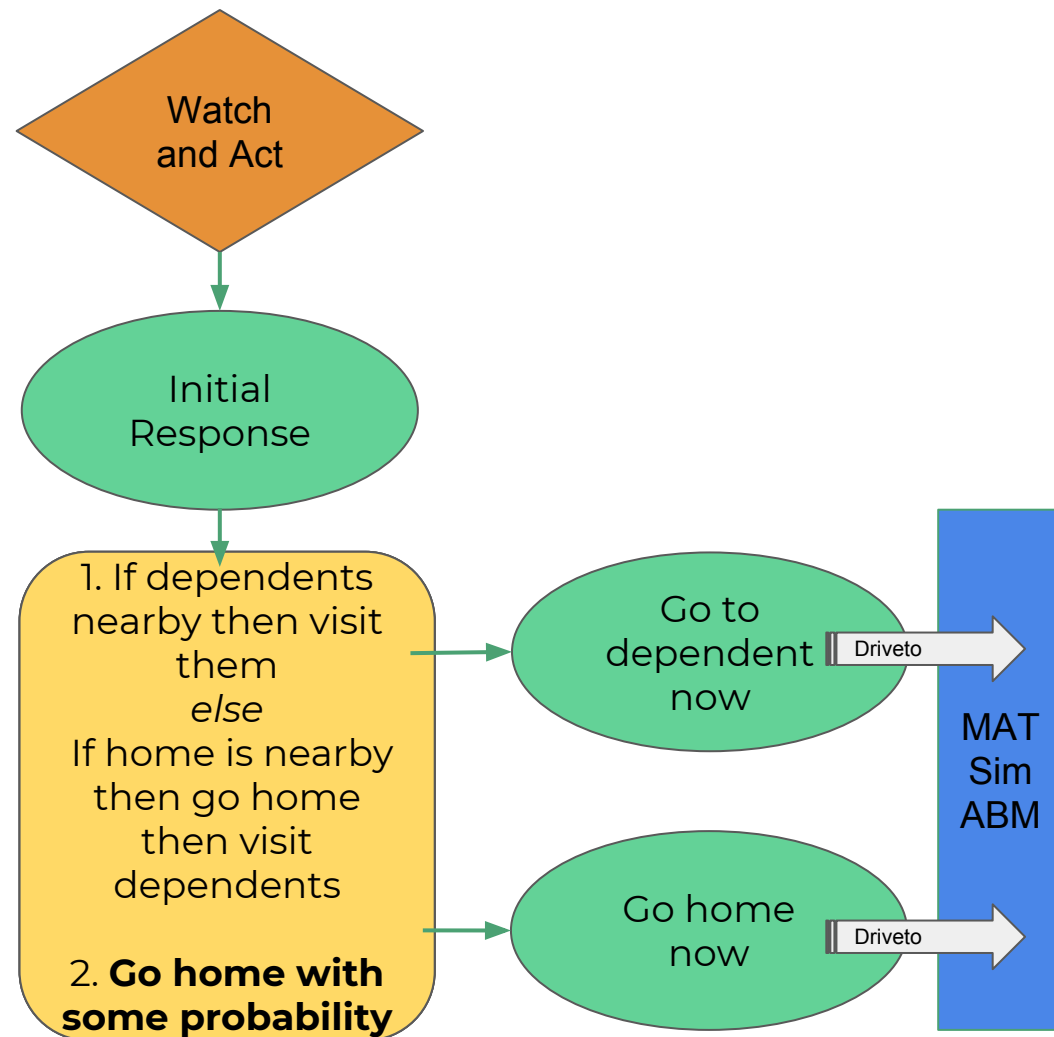
R6 leaves from current location at work.

R7 goes home after shopping then leaves.



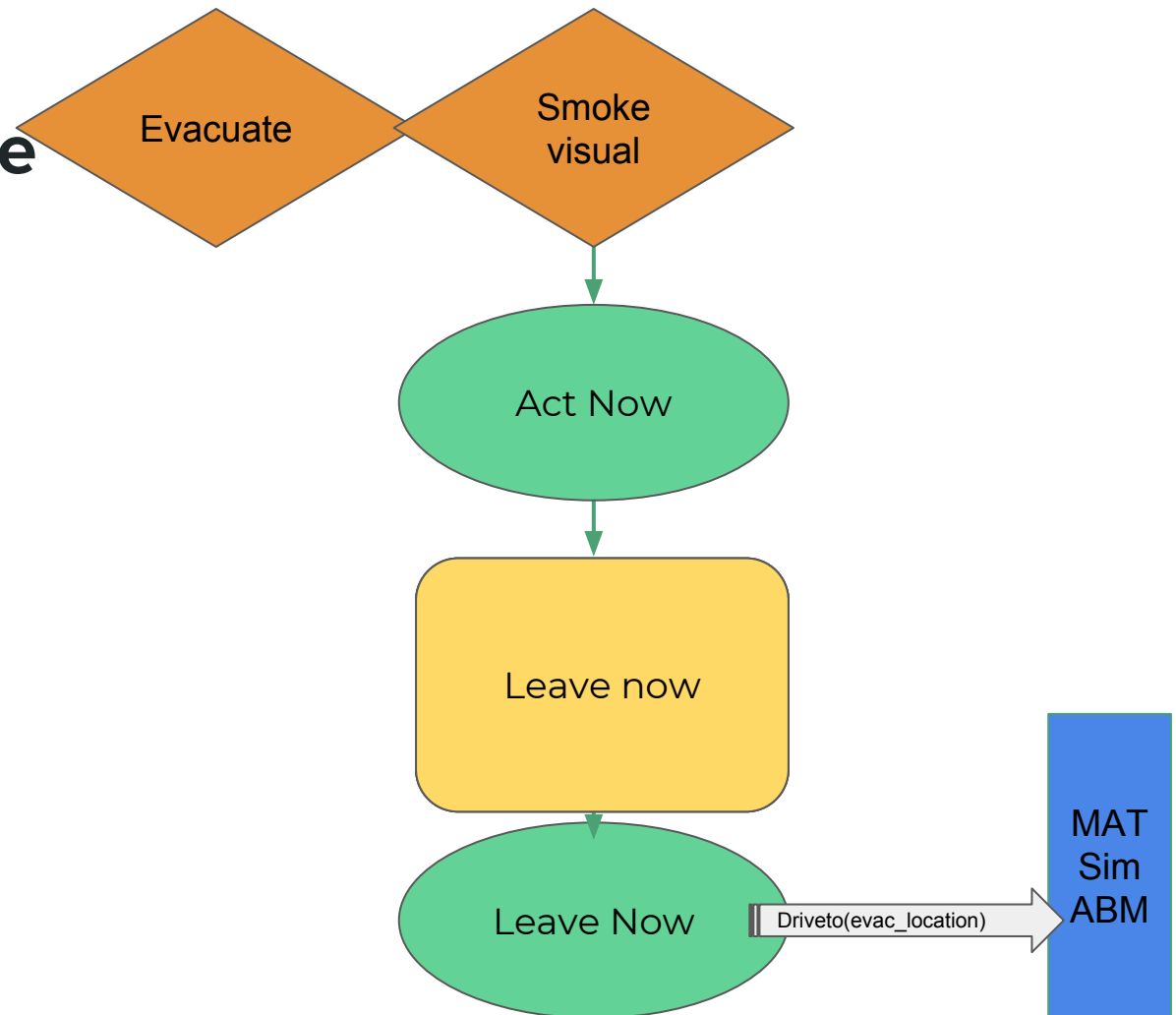
Resident | Example

INIT=2
ACT=5
T=2
E=0
home=(x1,y1)
dependents=T
dep_location=(x2,y2)



Resident | **Example**

INIT=2
ACT=5
T=3
E=3
home=(x1,y1)
dependents=T
dep_location=(x2,y2)
init_resp=T



Behaviour Response for other groups

*Goal structures for other subgroups are reductions of the **Resident** case.*

Part-time Resident: Similar to **Resident**, but less chance of having a dependent (?).

Regular Visitor: No dependents, but can still prepare without committing to leave.

Overnight Visitor: Will not have dependents, and will never wait and see (ACT=INIT). May return to accommodation to collect things before leaving.

Day Visitor: Will not have dependents, will never wait and see, and will leave straight away upon acting.

Resident | **When things turn ugly on the road...**

For instance: fire too close, road closed, accident ahead, stuck in heavy congestion..

IF	THEN
On the way to collect dependents	Will continue to pursue goal at all cost by trying to find an alternative way to get to them.
On the way home	Might drop the idea altogether and forego going home.
On the way to evacuation zone	Will try alternative places in this order: 1. an alternative safe zone 2. home or place of congregation whichever is closer 3. place of last resort like carpark 4. If all else fails will just stop moving .