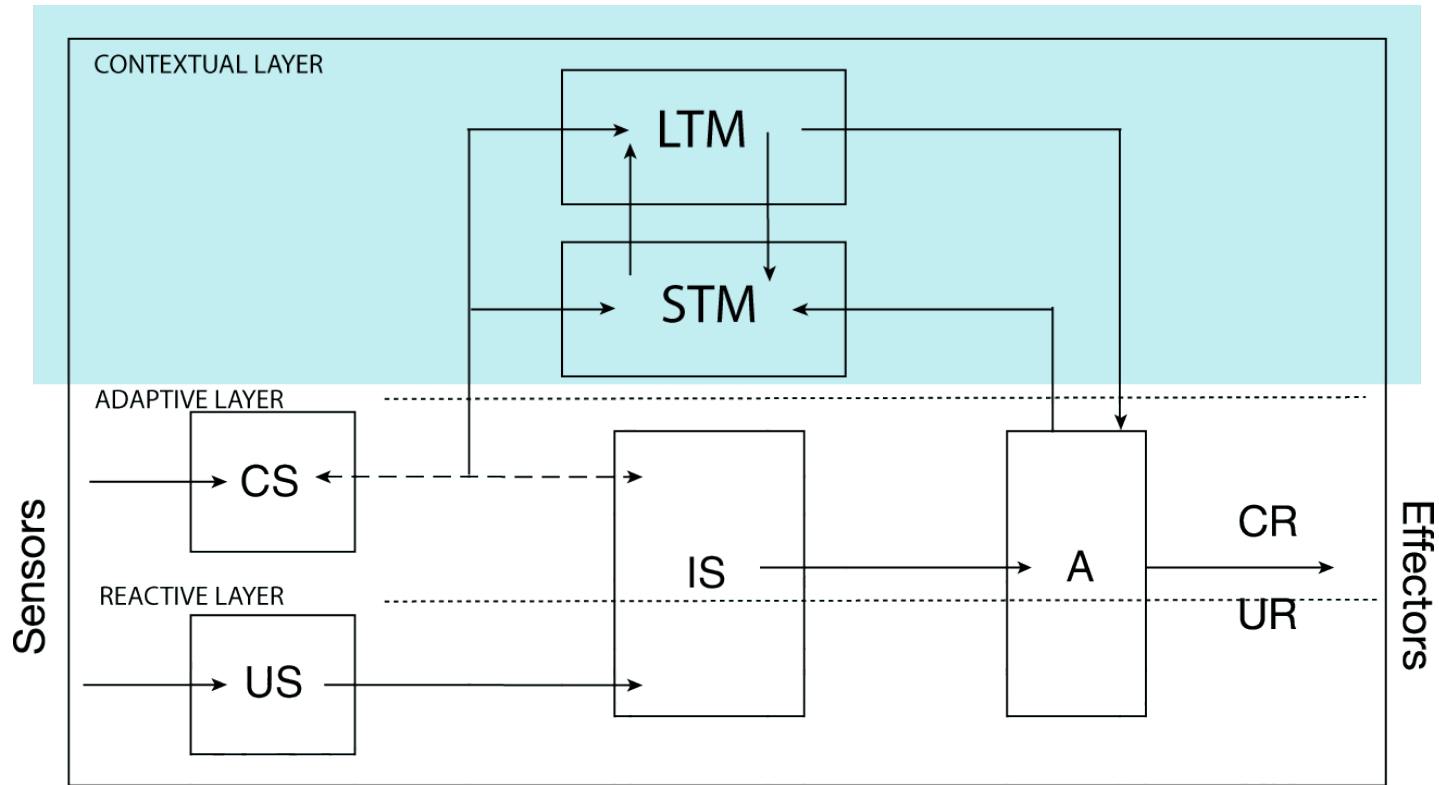


Contextual Layer

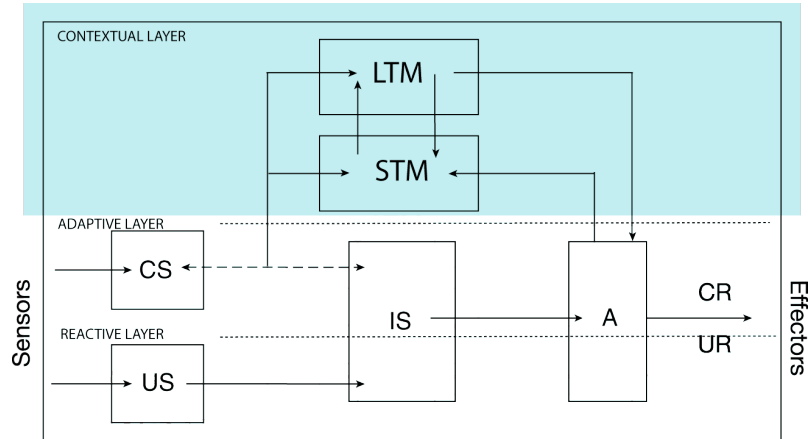
Encarni Marcos

DAC Tutorial 6th of September

Contextual Layer



Contextual Layer



Mechanisms for:

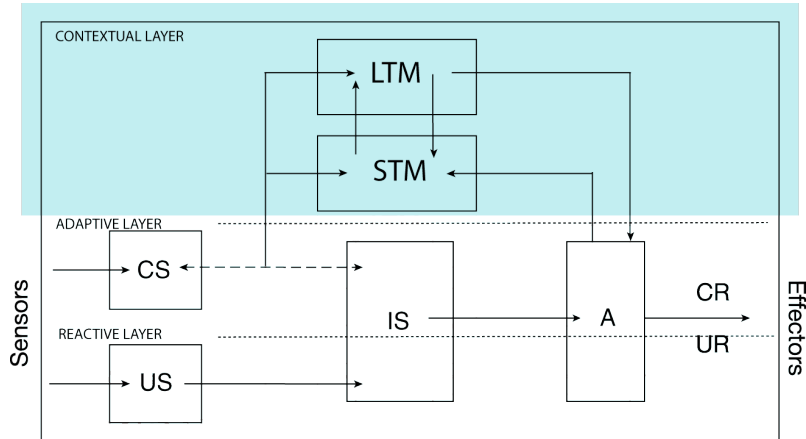
- Memorize

- STM stores sensory-motor events generated by the adaptive layer.
- When a goal state is reached STM is copied into LTM and STM is initialized.

- Recall

- The content of LTM is compared with ongoing sensory events.
- Matching elements contribute to action selection.
- Chaining in LTM is achieved by LTM biasing.

Contextual Layer



Mechanisms for:

- Memorize

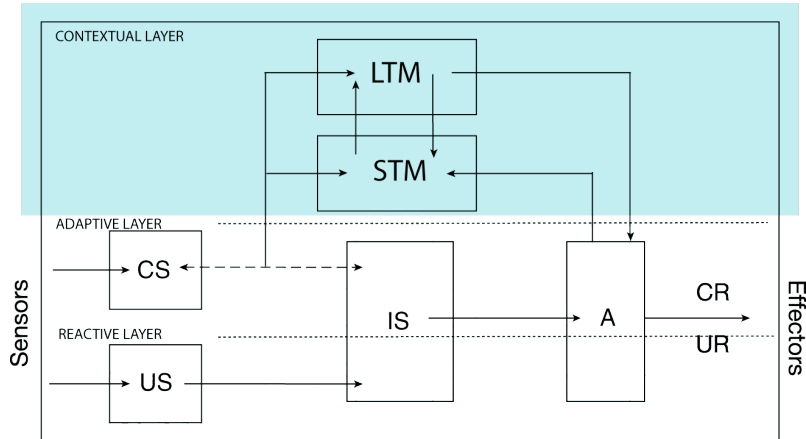
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Only activated when the discrepancy measurement falls below a confident threshold.

Contextual Layer



Mechanisms for:

- Memorize

- STM stores sensory-motor events generated by the adaptive layer.
- When a goal state is reached STM is copied into LTM and STM is initialized.

- Recall

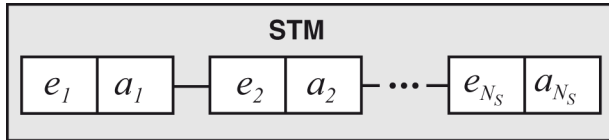
- The content of LTM is compared with ongoing sensory events.
- Matching elements contribute to action selection.
- Chaining in LTM is achieved by LTM biasing.

$$d(x, e) = \frac{1}{N} \sum_{j=1}^N \left| \frac{x_j}{\max(x)} - \frac{e_j}{\max(e)} \right|$$

Distance between actual CS x prototype and predicted CS e prototype

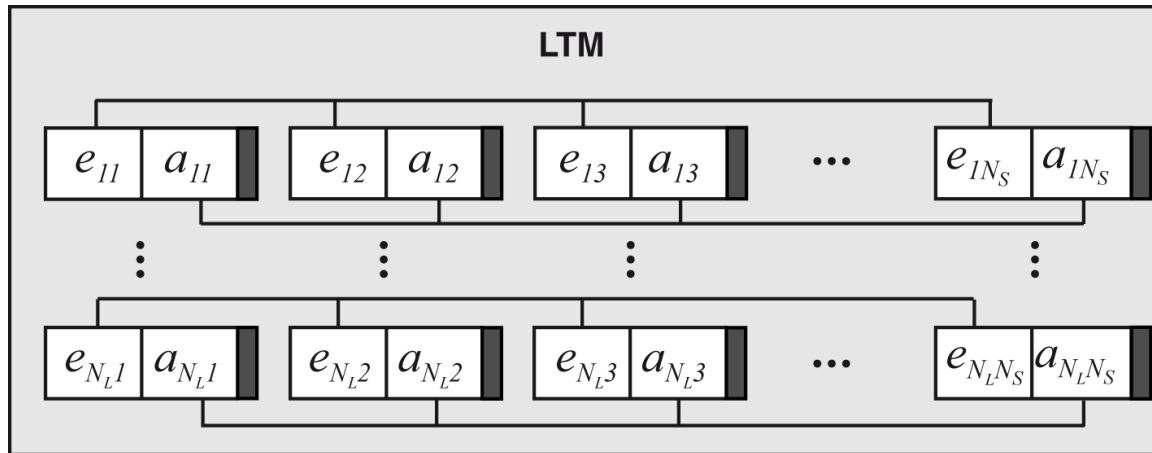
$$D(t + 1) = \alpha_D D(t) + (1 - \alpha_D) d(x, e)$$

Contextual Layer - STM



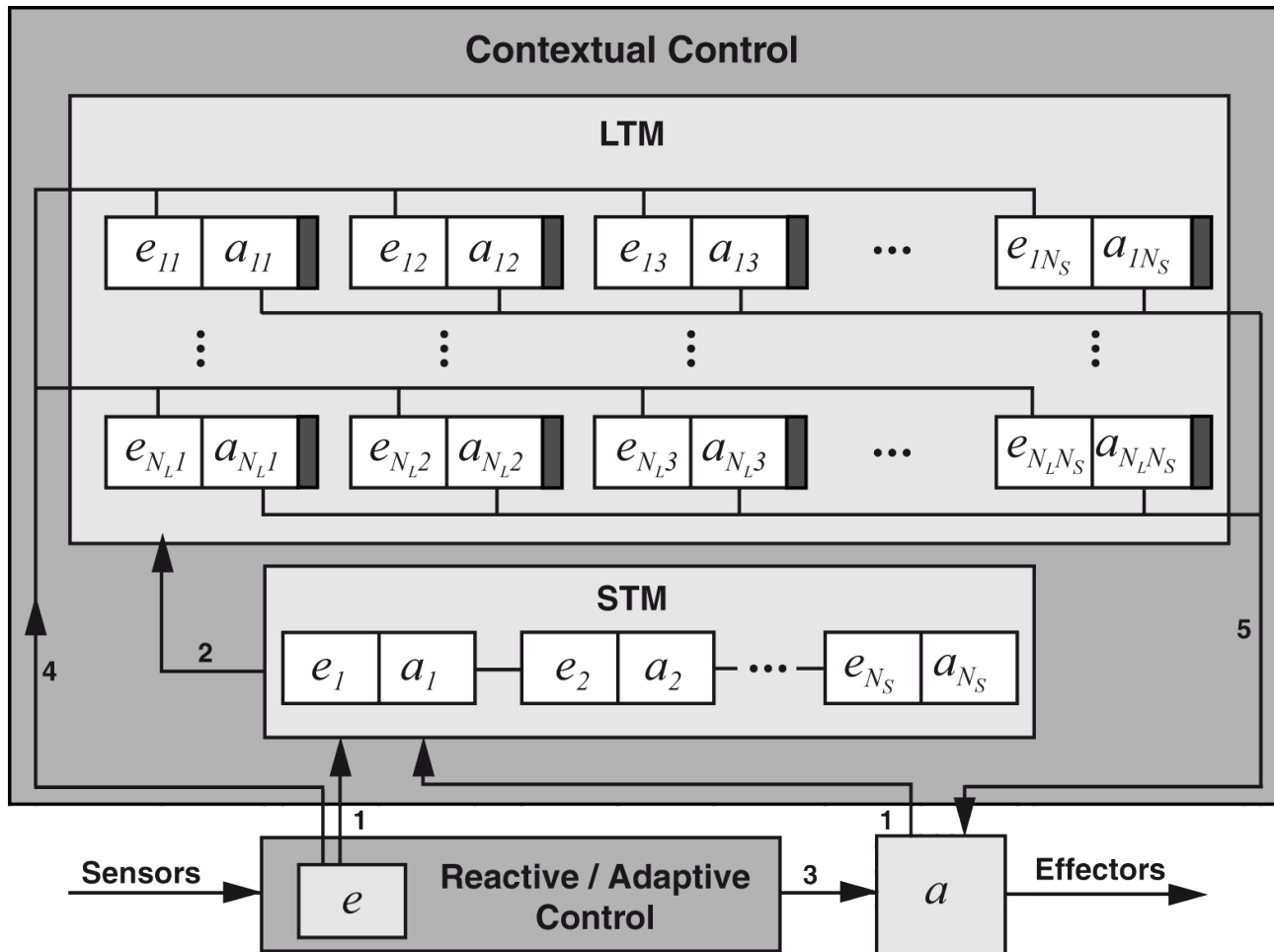
- Ring buffer.
- Every element is called **segment**.
- A series of consecutive segments is called **sequence**.
- It contains one sequence of N_s segments.
- Each moment generated CS prototype e and the action a executed by the robot are stored in STM.
- When a goal state is reached the sequence stored in the STM is copied into the LTM and the STM is reset.

Contextual Layer - LTM

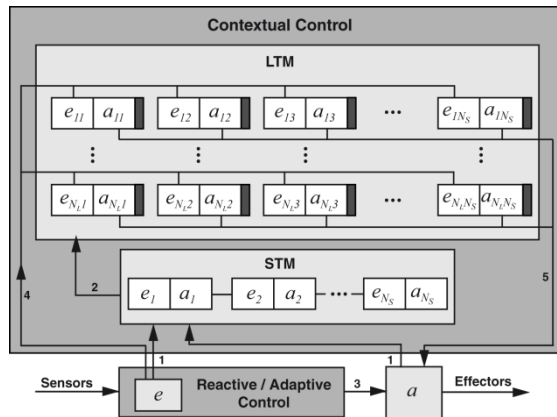


- The LTM has a N_L number of sequences of N_S segments ($N_L \times N_S$).
- Every element is called **segment**.
- A series of consecutive segments is called **sequence**.
- It contains one sequence of N_S segments.
- Each moment generated CS prototype e and the action a executed by the robot are stored in STM.
- When a goal state is reached the sequence stored in the STM is copied into the LTM and the STM is reset.

Contextual Layer



Contextual Layer - Recall



- The CS e prototypes stored in LTM are matched against the generated CS e prototype (c: collector).

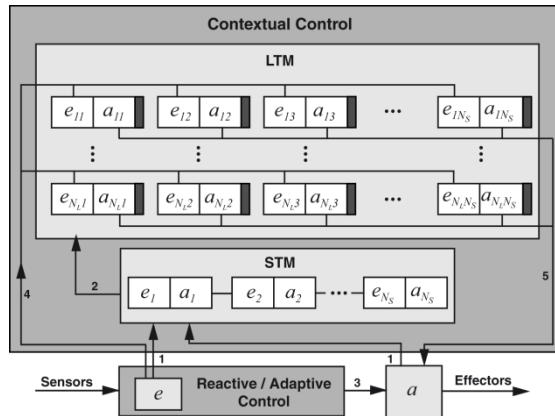
$$c = (1 - d(e, e_{lq}))t_{lq}$$

- It depends on the distance $d(e, e_{lq})$ and the trigger value.
- The trigger value biases the sensory matching process (chaining).

$$t_{lq}(t + 1) = \alpha_t + (1 - \alpha_t)t_{lq}(t)$$

- Only the collectors activity that satisfy: $c_{lq} > \theta^c$ and c_{lq} that win %-WTA competition are selected.

Contextual Layer - Recall



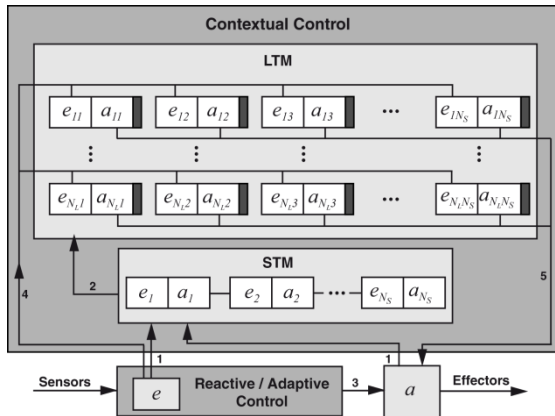
- The action proposed by the contextual layer is calculated as:

$$a_c = \sum_{l,q \in LTM} \pm \frac{c_{lq} H(c_{lq} - \theta^C)}{\delta_{lq}} a_{lq}$$

- δ_{lq} is the distance in segments between selected segment and the last segment in the sequence (i. e. the distance to the goal state).

- The sign is + if it belongs to a desired goal sequence and – if it belongs to an undesired goal sequence.

Contextual Layer - Recall



a_r has the highest priority, then the a_c and then the a_a

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