STARTLE: A Biologically-Inspired Architecture for Cued Detection

SEAS DTC Project: SEN ADD 057

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STARTLE: Bio-inspired UxV threat detection

STARTLE is a bio-inspired threat detection architecture for local protection of autonomous vehicles

STARTLE emulates the mammalian conditioned-fear response mechanism

Early threat warning can cue power management changes, e.g. starting up a gas turbine in readiness for increased power demands for sensing and propulsion

The approach can also be used to provide automatic situation monitoring for existing manned vehicles, piggybacking on data from existing sensors

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Uses of STARTLE

STARTLE can be applied to:

- **External threat monitoring for UxVs**
- **Internal system status monitoring of UxVs**
- **External threat monitoring for manned vehicles as a mid-life enhancement using existing or enhanced sensors**

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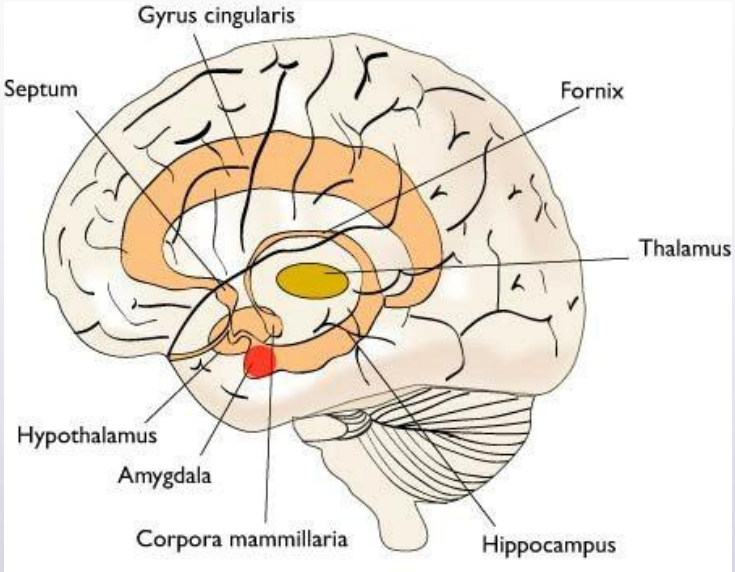
STARTLE is bio-inspired



STARTLE emulates the mammalian amygdala (conditioned fear response centre) in cueing higher processing

In mammals, almost all sensory data gets routed via the thalamus to the amygdala for a "quick look" and separately to the higher processing functions for more detailed examination, with attentional cueing provided by the amygala's "emotional" response

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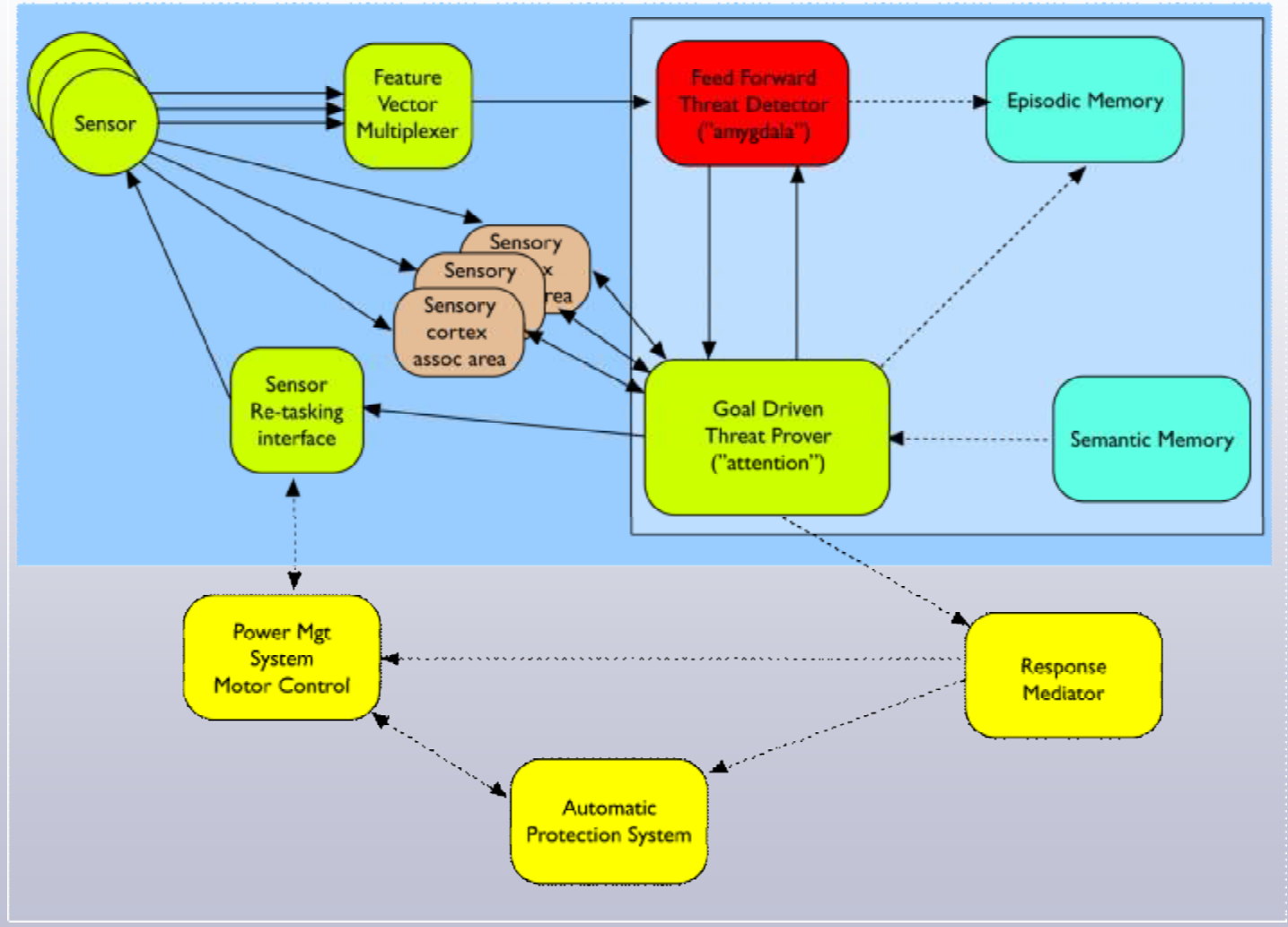
STARTLE Architecture



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Main components of STARTLE

Neural network

- *"Piggybacks" on an existing sensor data stream*
- *Fast throughput monitoring and alerting*
- *Triggers the rule system to assess threats*

Rule system

- *Provides cued sensor re-tasking (rules explicitly request additional data to be collected from a particular sensor / processing algorithm)*
- *Gives traceability allowing reasoning to be validated*

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Deploying STARTLE

Neural Network training can be based on real or synthetic environment derived data, allowing wide range of potential operational scenarios to be investigated

Rule system is compiled by domain experts and allows system to request the most appropriate sensor data to confirm potential threats

Learning – STARTLE has potential to accommodate on-the-job learning in future systems

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STARTLE Summary

STARTLE: A biologically-inspired architecture for cued threat detection for local protection of autonomous vehicles

Emulates the mammalian conditioned-fear response mechanism

Lightweight feed-forward threat monitoring task

- **receives relatively unprocessed data from multiple sensors**
- **warns the system to change its attention from its assigned task**
- **diverting sensing and processing resources to a…**

…Model-driven, goal-proving threat assessor

- **intelligently assesses a perceived threat to own platform**

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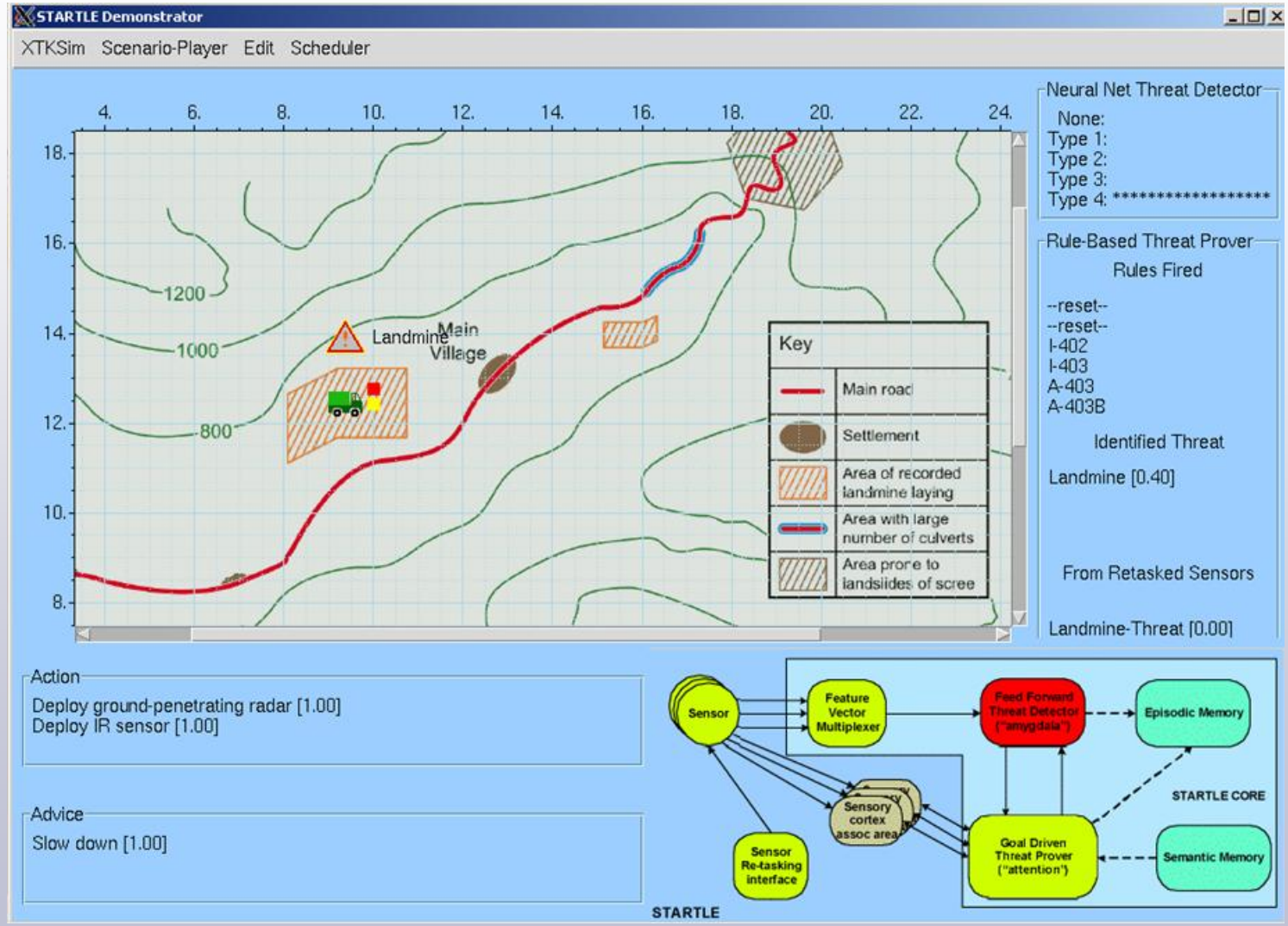
Demonstration of STARTLE



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