

# Cognitive Agents Toolbox

The Cognitive Agent Toolbox (CAT) is a unique software integration tool to make autonomous vehicles and machines more intelligent. To provide intelligent behaviour in complex situations it enables the programmer to define and deploy rules and behaviour modes in English sentences. The resulting software is a type of rational agent called “**sysbrain**” that controls the machine. **Sysbrains** can be programmed to have unprecedented level of adaptability and environmental awareness.

## Benefits

### To system programmers:

- You can formulate the basic **behaviour rules** for safety and priorities **in English sentences**, declare values of events and actions.
- Code development is **easily shareable in a team of programmers** as all code of your sysbrain is in natural English sentences of your choosing.
- You can program your sysbrain agent to enable it to **solve complex problems** across physical domains based on the principle “everything is possible that is not disallowed by the rules” .
- CAT enables you develop a sysbrain anticipates the future and makes **logic based decisions on time** as things happen in the world.
- CAT enables you to develop a sysbrain type of agent that, upon request, can also **describe the reasoning behind its decisions**, ongoing actions, reactions to events in English.

- Support and developer feedback is available via <http://dev.sysbrain.com/bugs>.

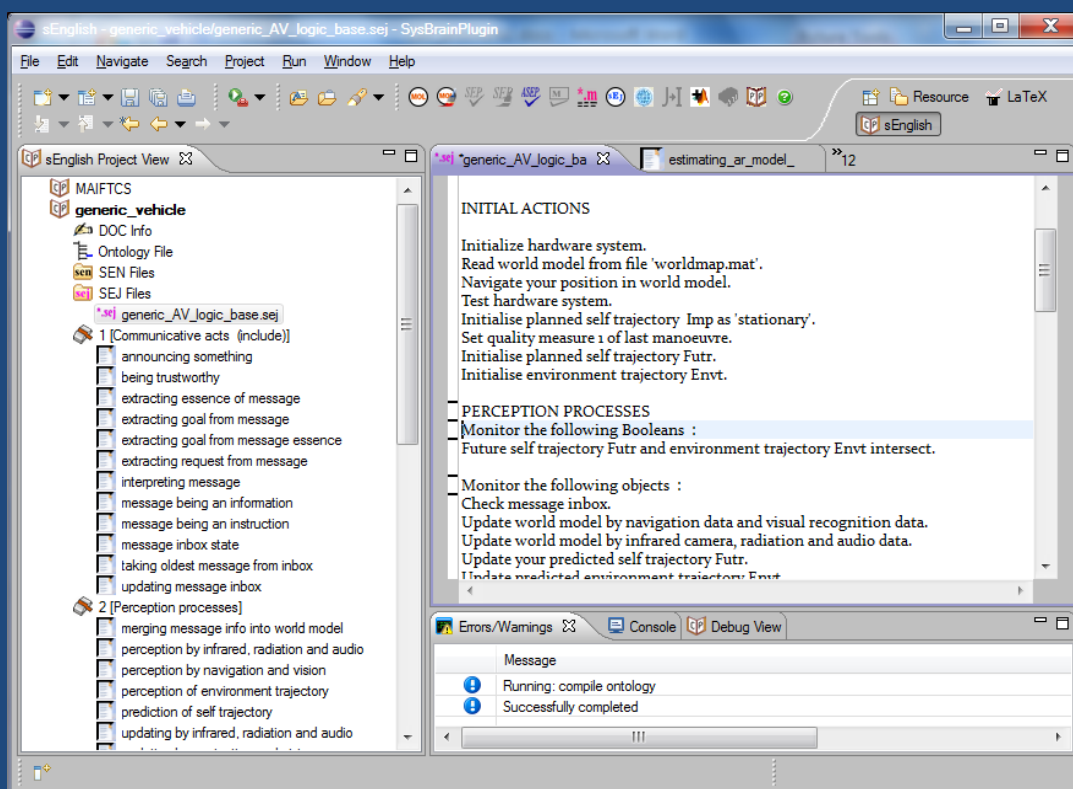
### To users of robots:

- The **manual of your appliance is its program**, some parts of it you may be able to redefine in English sentences to modify its behaviour.
- You can **ask your appliance to explain** what is going on, you can receive reasons for actions or lack of them.
- Intelligence updates are by the device **reading publications on the web**, that you can also read, not by replacing your device.
- Manufacturers can release **new sensors/actuators to be added/removed** that is automatically integrated for you, **better value for money**.

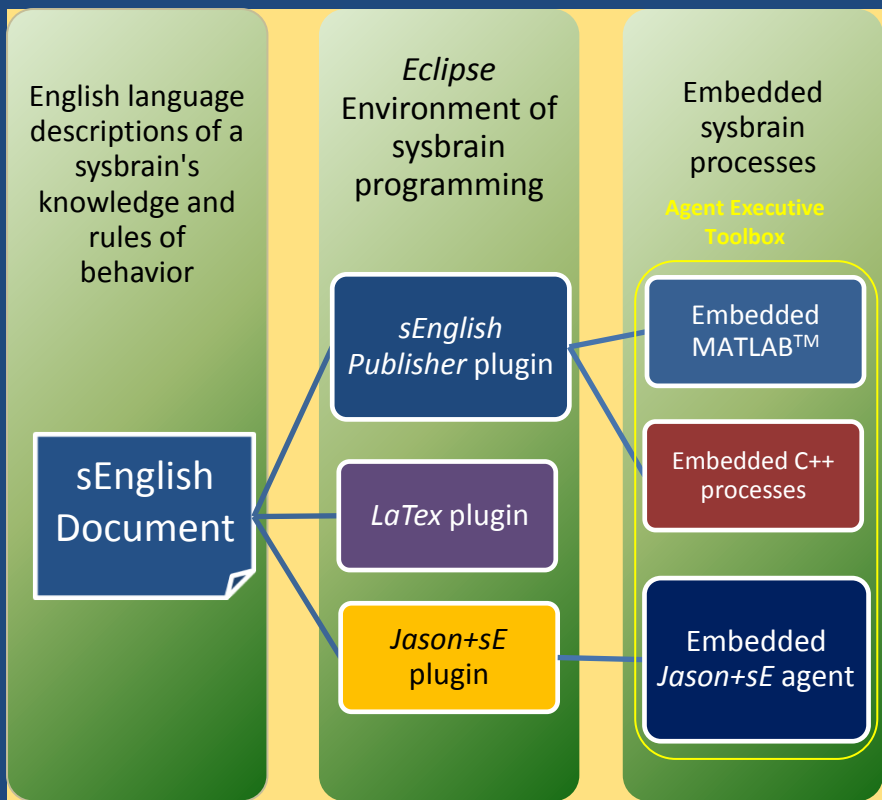
The CAT Application Programming Interface (API) contains:

- sEnglish™ Publisher on Eclipse
- sEnglish to Jason+ Compiler
- Web/PDF Publisher
- Document Reader Tools
- Executive Toolbox for MATLAB/Simulink™
- **Jason+ sE to MCMAS compiler\***
- **Formal verification tool set\***
- **Java Virtual Reality Tools for complex environments\***

\* *under development*



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## A sysbrain's creation

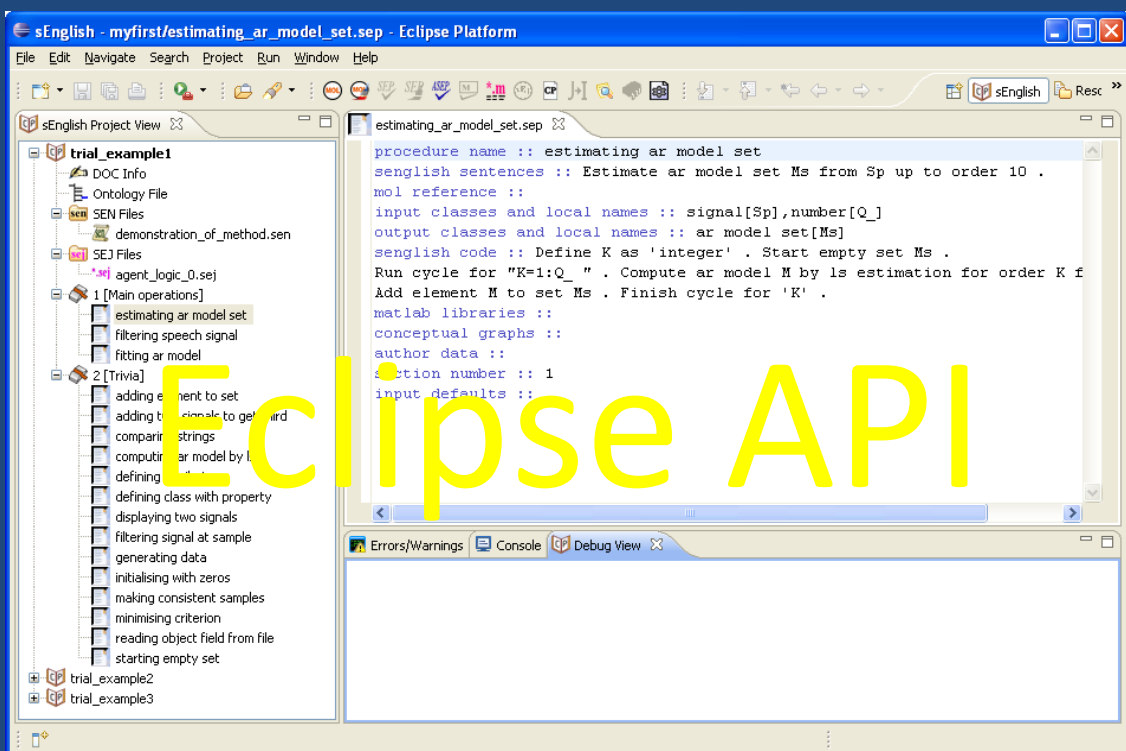
CAT is a complete system for **creating, machine intelligence with lifelong learning** while serving its human users.

CAT is based on the use of an **English language document** to encode the behaviour of intelligent agents controlling a machine.

The documents is conceptually organised in such a manner that it supports easy **understanding of the agent's knowledge of the world**, its reasoning and its behaviour constraints limited by safety, morality and ethics.

Technically a single **Eclipse based Application Programming Interface (API)** is used to do

- (1) Create and author an sEnglish document describing and editing **an agent's knowledge or skills**.
  - (2) **Publish** this knowledge on the Internet or in print as **HTML or LaTeX/PDF** based document
  - (3) Compile **agent reasoning** into Jason/Java processes into a .jar file
  - (4) Compile **signal processing procedures** of sensing, modelling and control into embedded processes in MATLAB/C/C++.
- Automatically integrate **sEnglish published agent skills** in journal and conference papers.
- (5) Use the **Agent Executive Toolbox** to produce embedded applications for devices .

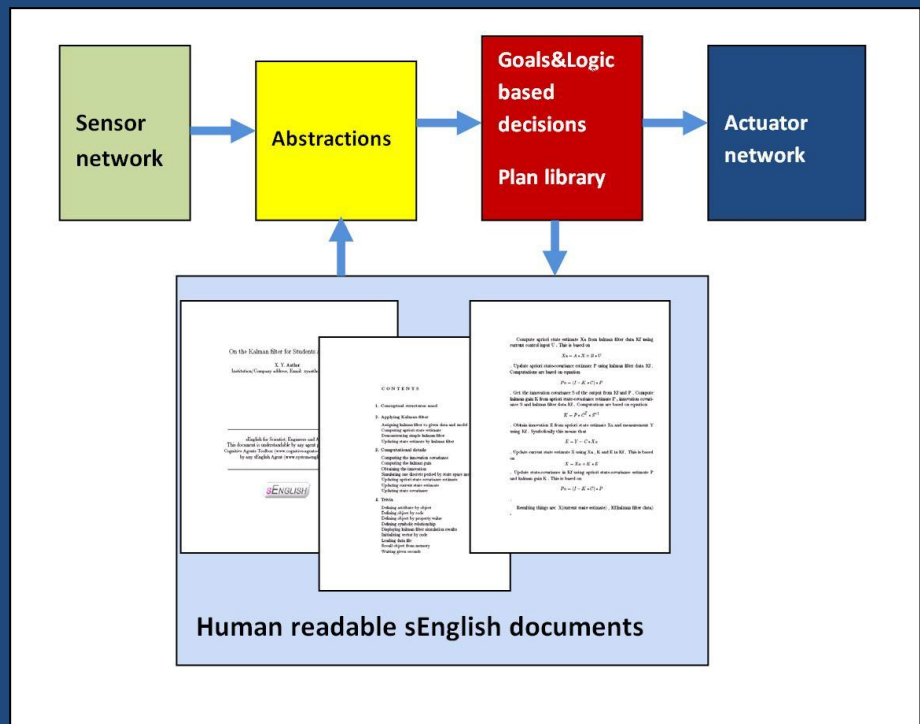


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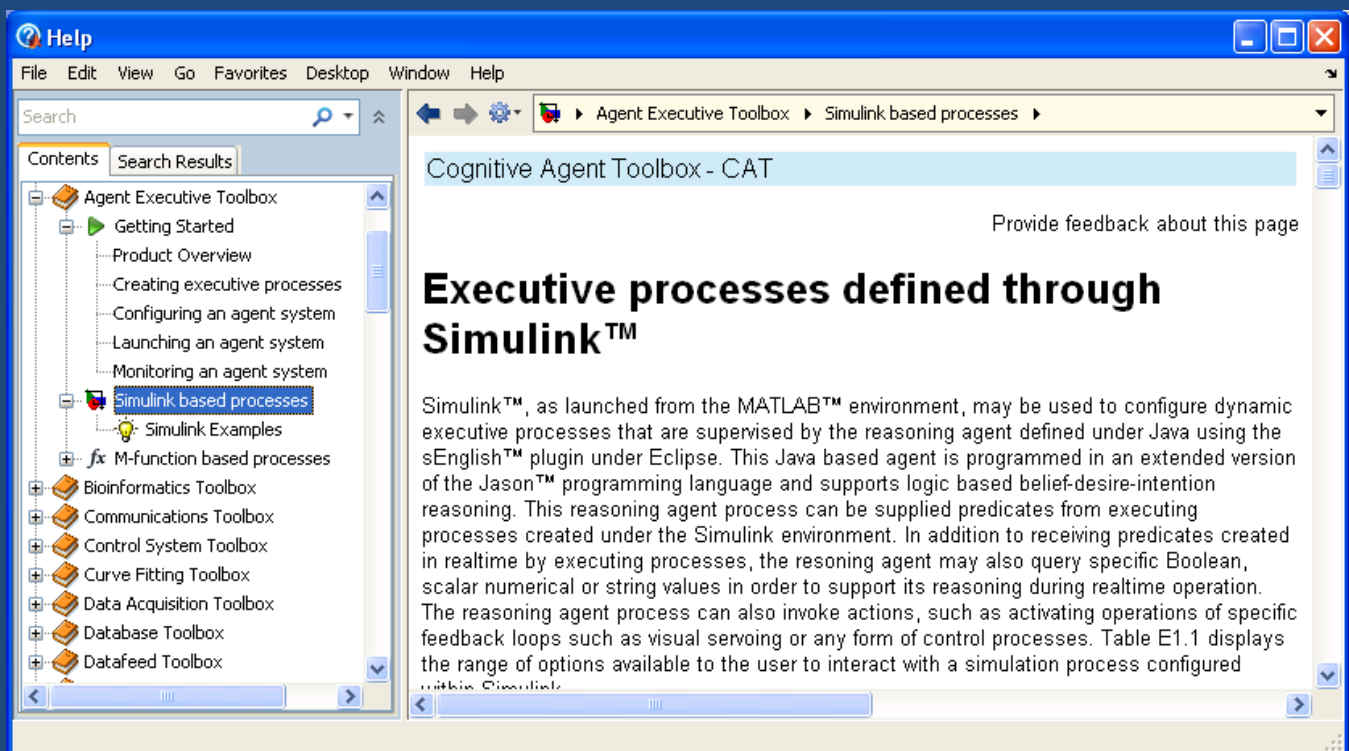
# Machine knowledge development

At the base of all agent knowledge lies its document that summarises its behaviour to both humans and the agent itself. The document is a “summary” that unambiguously compiles into the executable code of the agent. This document is a summary as it is written at a very high abstraction level. High abstraction level objects and relationships in the world model, which can be shared by humans, are explained by English sentences. Building up of meanings is hierarchical until sentences are only explained by a piece of MATLAB code.

MATLAB is universally capable to handle sensing, signal processing and control procedures and compiles into C/C++ for embedded code for small devices. Signal processing and feedback control is abstracted into concepts and relationships through the use of sEnglish that agent logic can handle. All of the goals, logic based reasoning, sensing are expressed and related to each other in English sentences.

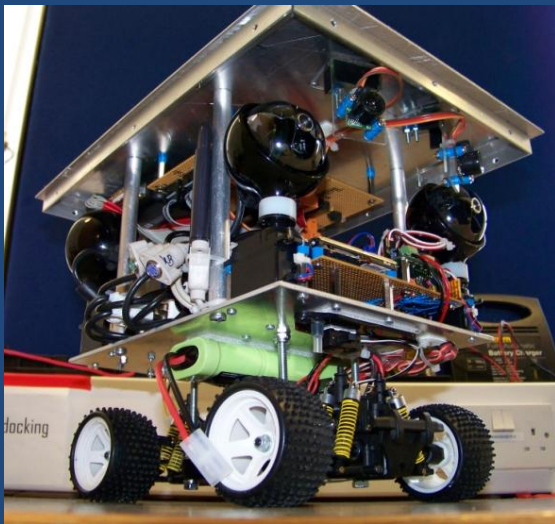


The **Agent Executive Toolbox** under the MATLAB environment enables you to connect rational agents with sensing, actuator, world modeller and predictor processes via sockets based communications.



The Cognitive Agent Toolbox is also available with our physical systems such as our intelligent rover vehicle that has spatial temporal awareness of its environment due to its unique CAT based programming.

# Intelligent Rover

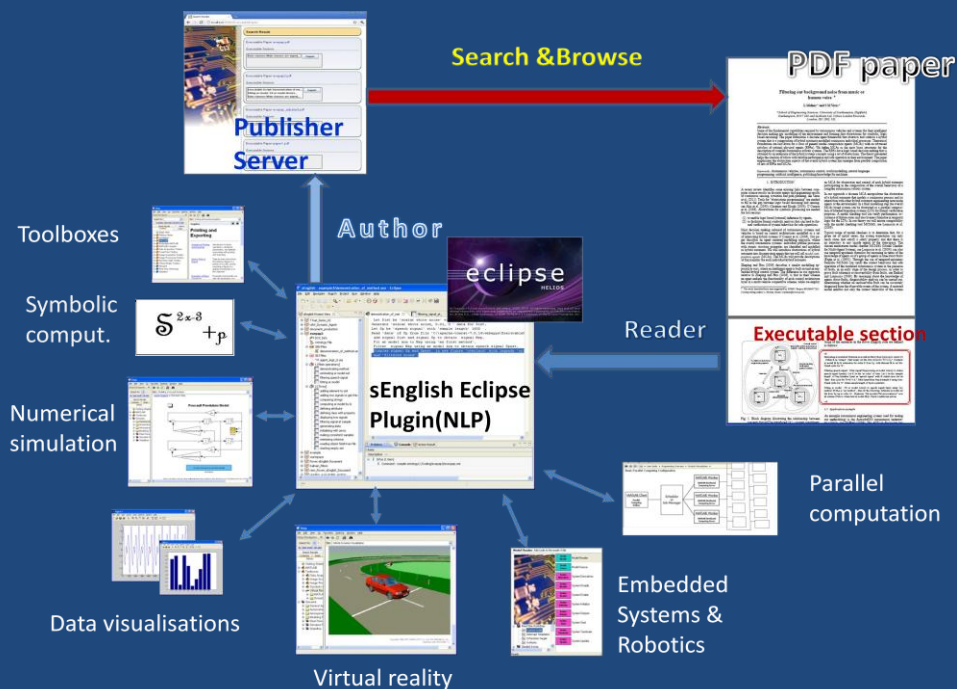


## Sensors:

- Powerful embedded computer capable of processing images from all cameras and other sensors simultaneously
- 4 cameras
- Precise steering wheel angle encoder
- 2mm precision measurement of path travelled
- 2 ultrasonic obstacle sensors
- Microphone
- IMU (optional)

## Controls:

- computer controlled motor torque in four wheels!
- computer controlled steering servo
- pan and tilt angle of cameras
- speakers



The Cognitive Agent Toolbox is part of a comprehensive machine knowledge development system: **sysbrain agents** can read PDF journal paper sections written in sEnglish and incorporate those into their skill base. This enables maximal utilisation of a piece of hardware sold as robots are then committed to lifelong learning as humans do. Developers, researchers and enthusiasts can publish for machines.

Further information can be found [www.cognitive-agent-toolbox.com](http://www.cognitive-agent-toolbox.com). Email: support(at)sysbrain.com . [www.senglish.org](http://www.senglish.org) and [www.system-english.com](http://www.system-english.com) by SysBrain Ltd. Reg. England & Wales 04583971, Reg. Address 10 Rothschild Close, SO199TE, UK, Fax: +44-2380433122 , Tel: 0771 760 2801