

EgypTeam Intelligent Solutions

Clever: Intelligence Framework

Technical Presentation

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1. Introduction

Clever is an implementation of EgypTeam's Cognitive Framework. Through a very clever design, Clever is capable of act as intelligent agents in complex and heterogeneous environments.

So far, a lot was studied and developed on Artificial Intelligence. There are a lot of systems, good implementations for efficient algorithms and techniques that can solve a wide range of everyday problems that can be solved with Artificial Intelligence. Unfortunately, there is not a widely agreed framework for Artificial Intelligence. There are programming languages, runtimes, but they are not easy to use and integrate with the current systems and APIs.

The idea for Clever is providing a new, efficient and versatile framework for solving problems with Artificial Intelligence, that can be easily integrated to contemporaneous systems, such as third-party APIs, social networks, I/O devices, such as cameras, microphones, speakers and screens, computer networks, and IoT devices.

2. Concepts

Clever and EypTeam's Cognitive Framework provide some concepts that are very important for its operation and also for its understanding.

- **Clever Components** – All software modules that together make up Clever as an Cognitive System / Intelligence Cognitive Framework Implementation. Kernel, and Interfaces;
- **Kernel, Intelligence Unit or Engine** – Responsible for integrating all modules and providing the Signal Bus, that is a part of the kernel responsible for information exchange, specifically signal exchange;
- **Information** – Piece of knowledge about anything (Semantics);
- **Data** – Material information / instance of information (Syntax / Information stored somehow in clever components);
- **Mind** – Multi-layer data structure for storing data. It can have one or more layers. It is part of the environment;
- **Interface** – A module that provides interaction with the environment;
- **Sensor Interface** – An interface capable of retrieving information from the environment;
- **Actor Interface** – An interface capable of modifying the environment;
- **Signal** – A piece of formal data inside Clever;
- **Signal Bus** – Structure for providing signal exchange among interfaces themselves and among interfaces and Clever;
- **Terminal** – A point of access to user or a third-party software exchange signals with Clever.

3. Kernel

The simplest but no less important in Clever design is the kernel. The kernel provides the possibility to the other modules exist and interact. It's the main process, to which all other components are attached.

3.1 Signals and Signal Bus

Signals are the data pieces that can be stored into clever, also, they can be interchanged among all the components, such as the interfaces (interface – interface or interface – kernel). Signals can be directly sent or enqueued to one interface. If it's directly sent, there is a return or result signal. If they are enqueued, they are processed by the interface in a FIFO (First In First Out) fashion.

Clever can use signals for exchanging data among the interfaces or for sending commands to be executed by them.

4. Interfaces

Although kernel is very important, and place a very strong role in Clever's operation, it's needed something to provide Clever the access to the environment, for perceiving and acting. These components are called Interfaces. It needs to have somehow to "read" the environment, that is, some way to get information from the environment around it, the sensor interfaces. Sensor interfaces play a very important role. It tells the agent how it is the world around it. Also, the mind itself can be thought as part of the environment, where Clever reads when it's remembering something. Also, Clever needs somehow to "write" into the environment, that is, some way of modifying the environment with some action, the actor interfaces. Also, the mind itself can be thought as part of the environment, where Clever writes something to it when it's storing something to remember later. These two categories of interfaces are not mutually exclusive, as can be easily seen, taking the Mind itself as an example. Let's see some example of interfaces.

4.1 Sensor Interfaces

Some examples of sensor interfaces are:

- Mind Interface – The mind is part of the environment. There are usually information stored into it as data [signals]. When Clever access the Mind to remember information that it already knows, it's reading the environment. Mind is also a Sensor Interface;
- Microphone – Clever can be used to "hear" sound, analyze it, understand it and transform it into knowledge data signals. For example, it can hear a voice, decode into words, and build the information data signal that those voice was telling;
- Terminal – The terminal is a component that is a direct point of access to Clever. It's a way to connect directly into Clever, and sending signals to it. So Terminal is also a Sensor Interface that reads signals inputted by the user into a keyboard or network connection.

4.2 Actor Interfaces

Some examples of actor interfaces are:

- Mind Interface – The mind is capable of store information data signals. So, there must to be a way to write into it. As Mind is itself part of the environment, Mind is also an actor interface, that provides Clever a way to store information data signals into it;
- Speaker – Clever can be used to "produce" sound, based on it's internal mind state. For example, it can communicate to other agents through sound, transforming the information it's wanting to say into words, and then synthetizing voice to tell those words and using the speaker to produce the sound

- **Terminal** – The terminal is a component that is a direct point of access to Clver. It's a way to connect directly into Clever, and receiving signals to it. So, terminal is also an Actor Interface that write signals for user see, through a screen or network connection.

5. Applications

Some applications for Clever.

5.1 Social Network Automation

5.2 Software Testing

5.3 Playing Chess

5.4 Music Synthesis

5.5 Personal Assistant