AI - Open source AI for human-like interaction.

All concepts are based around events which are made of actions (verbs) and objects (nouns). This can represent everything that happens in the world.

Emotion is an inherent property of the brain. Before a baby is able to act, it experiences emotions. Like a baby, it is important to first give an AI the ability to understand emotion before it will behave like a human. This is done by an internal knowledge of right and wrong

Once the baby understands emotion, it needs to understand cause and effect if is going to achieve anything in its life. This is done by remembering how each object gets used to see how it has been used in actions

# Goals

Decoupling between actions and objects as much as possible.

As abstract as possible so it can be used in any situation with appropriate

Trainable by being taught successive scenarios that can improve upon the initial manual training. The scenarios, if not taught a in a real time, would not give the AI time to think.

Modular as much as possible ie. Different emotional paradigms could be switched in.

No randomness.

Avoid binary checks wherever possible.

Want a unified solution. Single equation.

# Flow

Every object is a neuron. An ideal brain, simulated or otherwise, would have meaningful links between each pair of neurons. Neurons

Process:

Parse sentence (becomes a neuron/ a graph of interconnected ideas.)

understand sentence -

It flashes in nearby neurons many times starting with the weight of their link) and then follows their links the strength is each link is used recursively

Neurons stay in the mind or can be deleted. (Human control using a KEEP variable can override this.) The system should be overridable on a per-AI basis.

Gathers data from surroundings, either event or polling based on a loop. At set intervals and when

# Elements of the Mind

## Emotion

Using this study [3] 27 emotions were identified. Each of them, excluding surprise, is either good or bad, and each can be negated by one or more of the other emotions. This negation is used when interpreting events.

* Admiration
* Adoration
* Aesthetic appreciation
* Amusement
* Anger
* Anxiety
* Awe
* Awkwardness
* Boredom
* Calm
* Confusion
* Craving
* Disgust
* Empathic pain
* Entrancement
* Excitement
* Fear
* Horror
* Interest
* Joy
* Nostalgia
* Relief
* Romance
* Sadness
* Satisfaction
* Sexual desire
* Surprise

### Understanding Emotion

The key idea is valence – the goodness or badness of something.

To teach emotion, or at least a simulation of emotion, to a robot requires telling it how to feel about an initial set of things. A baby has years to learn and a lot of neurons to process that learning. The AI is not so lucky, so practically we need to manually teach it initial conditions.

A simple way to teach the bot how to feel is to assign every noun with a valence (goodness or badness) value between -1 and +1. Most people reach consensus on the core nouns. Verbs also have a mood value on the same scale. These are much more consistent between people than with nouns. For example, dying is universally regarded as bad.

The emotional impact of an event is based upon how the action affects the emotions of positionals.

Logic is built around the control of emotions.

In the example of dying, if somebody bad dies, that is seen as something good. Simply, the mood of an event is the product of the mood values of the subject of a sentence, the verb, and the object. For example, “Man kill dog”. Man is good (+1). Dog is good (+1). To kill is bad (-1). The product ends up negative. With different mood values for each word, the product can be anywhere on the scale between -1 and +1 rather than just binary good or bad.

Adjectives can amplify or reduce emotions - e.g. "my" amplifies. "broken" would reduce.

There is endless nuance with language and emotion, and most likely there will never be a fool-proof way to simulate emotion for all events, but can a way to deal with some degree of nuance is to give nouns flags like "edible" which can modify how certain verbs affect them. Replace the tags with scaled values from zero to one or undefined value.

The goal of the AI is to perform actions based on its senses but also its thoughts.

If AI hears something spoken, it is treated like the event happening multiplied by a factor based on the mood value of the speaker (up to a maximum factor of 1.0) so a story is not treated as more important than the actual event.

Work needs to be done on how the emotions interact beyond their valence as it is a little patchy. I think it is best to get most of it all in a usable state before spending too much finetuning each of the systems.

Surprise is treated separately and is experienced when, for example, a good object performs a bad action. This creates doubt in the AI mind.

Surprise is neither good nor bad but is used to express how sure the AI is of something. If something surprising happens, it is considered as less real

## Personality

Personality is based on the NEO\_Personality\_Inventory [1]. The 16PF system has been considered but such granularity of personality is needed at this stage.

NEO has five scales:

openness : habitual to adventurous/imaginative

conscientiousness : spontaneous to organised/deliberation/thorough

extraversion : introverted to outgoing

agreeableness : suspicious/cold to warm/trusting

neuroticism : even-keeled to anxious

Openness could determine how likely the AI is to use an already observed action in response to an event compared to something new.

Conscientiousness could determine how deep the AI runs simulations.

## Needs

Maslow’s Hierarchy of Needs [2] provided a framework for what a human being requires. Based upon this, human needs can be summarised with the following scales:

* Food
* Drink
* Sleep
* Warmth
* Toilet
* Health
* Safety
* Intimacy
* Esteem

While the first five are simple to simulate, the last 3 would require some careful thought when attempting to simulate. Health is more complicated than a simple scale.

## Health

Health can be summarised

* Level of blood
* Mental illness – this would definitely affect the actions performed.
* Pain
* Diseases / illnesses
* Shock

## Memory

There are different memories in the human mind. On the basic level, short term and long-term. Muscle memory is not considered

### Causality

The AI recalls each use of a object and then when that objects is observed the next time, makes a link between the use in the first verb and this use. For example, “friend see bandit” could be followed by “friend shoot bandit” and then perhaps “bandit shoot friend”. The AI would remember the link between the subject and object of “see” and the subject and object of “shoot” and then would link the subject of “shoot” with the object of “shoot” and vice versa. In this way, it will learn that if you shoot someone, they may shoot you back, and if someone sees you, rather cynically, they might shoot you.

The time between uses of the noun is considered, with nearer events seeming more probable. Over many simulations, this would create a map of likely outcomes for each action. One ostensible downside is that cause and effect is never 100% confirmed.

### Nuance

In the event “man eat dog”, despite each element being good, has a negative effect, because we don’t want somebody to eat a dog. To avoid this, perhaps, the edible tag is only added after you see somebody eat something successfully? Training like this needs to be built in but it can be added manually. Same with animate tag etc. threat tag? Tagging saves the AI from calculating future branches in certain situations. For example, if AI see something eat some inedible, it will cache that strong emotional response. Each word it will see in what context it is use frequently (make a list of actions and objects) for each word - perhaps surprise if there is a new one. What does surprise do?

It would be possible to dislike man eat dog by following the path of man eat dog > dog die which may make tagging unnecessary.

## Learning

The emotions attributed to objects and actions can change over time based upon the context of the surround actions and objects.

The first time a concept is encountered, the context in which it is heard determines if it is good or not.

If the object is performing a bad action, it is seen as equally bad as that verb. The AI's opinion about each object is modified continually by the actions they do - Good verbs increase opinion and bad verbs decrease. Likewise, verbs change opinion based upon if they are done by good or bad thing

## Decision-making

The most complex part of the AI is that which ties everything together. Ideally, the way this section would be constructed would be conducive to further machine learning – i.e. A series of inputs, processes and then the output: actions.

The AI looks at several possibilities by running simulations and looking at outcomes and the emotional effect of each action and possible subsequent actions. It can perhaps prioritised things it has seen work before.

In effect, the AI randomly selects a subset of all possibility actions and picks the best to perform. In some cases, multiple actions can be performed. For example, “reload” and “run”.

One goal of the AI would be to combat negative emotions. Each emotion has an inverse emotion which, when experienced, reduces the feelings of the initial emotion.

It could also be an interesting idea to teach it specific abstract concepts that it could use to influences its decisions. For example, chaos and calm. Trying to maintain a balance between the two.

## Flaws

Humans are flawed. They forget things and make mistakes and don’t always consider the future. Mistakes under pressure. All of these can be incorporated.

# Translating the World into Code

For the AI to work, the World, be that real or simulated, needs to produce data that the AI can interpret.

This data is represented as events, currently in the form of sentences eg. “bandit shoot dog”. These events are comprised of an action, the verb, and objects, the nouns.

## Objects and Actions

Actions are assigned a valence value in in the range of -1 to 1. Objects also have a valence value and additional emotion values ranged from zero to one

They also have tags. They should be stored in a hierarchy to allow new verbs and nouns to be somewhat categorised without fully knowing about them.

Nouns and maybe verbs have size in the mind based on the number of links, emotion, and recent usage.

Actions have prerequisites before the AI can do them eg. for shoot - have gun, for walk - legs in good condition

## Vision

Vision in the realms of a video game can be simulated by using a camera, or perhaps raycasting multiple beams instead. Both are fairly computationally expensive, especially if several AIs need to work at the same time, so it may be better to using a simpler but less accurate method of simulating vision. The burden could be reduced by taking snapshot at a low rate. Perhaps 5 per second? A full render would not be required. Near perfect results could be achieve by just a diffuse and specular pass

Take a snapshot of the field of view. Assess all it can based on how much of the view it takes up, how much of the object is showing, much it has moved since last time and how much it is contrasted against its surroundings. This will then produce a seen event and a factor of how likely it is that the AI can then use to decide to investigate or run etc.

## Interaction

The AI can have a map of other AIs and how much it knows about each of them.

## Time

Time can be thought of in units of lifespan with a float value of 1.0 being one lifespan. Currently, the limited uses of time are based on simulation age, an integer value that increase every time the AI thinks. Time should be separated from the AI’s thought processes so the AI can multitask

While the AI is awake, the simulations would at some point need to be terminated. Perhaps there is no way to terminate thoughts unless a stronger thoughts happens While asleep, these can go on ad infinitum. These lets the AI dream. When the AI is in a stressful situation like combat, as indicated by high negative emotions, more time would be spent focussing on sensation and events and on reacting quickly. When the AI is more relaxed, it would concentrate on its thoughts, which are simulations

# Considerations

## Quality Optimisation

For each verb, an ideal equation should be found which determines the emotional effect of an event contain that verb.

Perhaps consider introducing goals as a step between memory and actions.

Each function could have different versions that can use different code to allow for the way different people experience and process things differently. Practically, checkMemory = checkMemoryAlzheimers.

For training. increasingly complex scenarios are fed into a machine e.g. Stories in the form of chained events. These demonstrate to the AI how one event can lead to another.

Somehow, the AI needs to know about trust.

The inverse of verbs may be different in different scenarios. If an emotion is reduced, it may cause one inverse, while if it is inverted by a verb, it may result in a different verb.

A way to make a true AI simulating the brain would be to have an array of neurons. Each neuron can be linked to any number of other neurons. A neuron would simply send a signal to the other neurons if it received enough of a signal from another neuron. New links are formed at random and can be reinforced if frequently used or dissolve if unused

Create an traditional AI. I stopped this idea because I feel less confident that it would work. It would require somebody entering their opinion on given sentences (which are assumed to be true) and then attempting to combine all object emotions with the nouns emotion to give the desired emotional output.

Metadata should be added throughout to provide better linkage between each of the elements.

# Bibliography

[1] <https://en.wikipedia.org/wiki/Revised_NEO_Personality_Inventory>)

[2] Maslow’s Hierarchy of Needs – just Google it.

[3] <https://www.pnas.org/content/early/2017/08/30/1702247114.abstract>

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