Dynamic Identity of Social Agents

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Social Identity @ Social Simulation Fest, 19 March 2021

Motivation

- The <mark>social context</mark> shapes **who we are** (our identity)

- **Who we are** shapes our <mark>behaviour</mark> and <mark>interpretation</mark> of a <u>situation</u>
  - We act according to our identity

- **Socially aware agents** should take into account <mark>social identity</mark> dynamics

Socially aware agents

- Understand **social context** (<u>who</u>, <u>what</u>, <u>where</u>, <u>when</u>)

- Adapt to **social context**
    - Update the <u>social identity</u>

- Use the <mark>active **social identity**</mark> to drive the decisions

The DIMA Model

Dynamic Identity Model for Agents (DIMA)[1,2]

- Social Identity Theory, Social Categorisation and Meta-contrast
- Agents <u>redefine</u> their (and others) <mark>identity</mark> either as **unique individuals** or as **members of a social group**
- Apply <u>in-group / out-group</u> dynamics do decision making

[1]Joana Dimas, Phil Lopes, Rui Prada: "One for all, all for one: Agents with social identities" in proceedings of CogSci'2013 - 35th Annual Meeting of the Cognitive Science Society, pp. 2195-2200, Berlin, Germany. August 2013. CSS.

[2]Joana Dimas, Rui Prada: "Dynamic Identity Model for Agents" in Multi-Agent-Based Simulation XIV: International Workshop, MABS 2013, Saint Paul, USA, May 2013, Revised Selected Papers, Shah Jamal Alam, H. Van Dyke Parunak (Eds.). Lecture Notes in Computer Science, pp. 37-52. 2014. Springer Berlin Heidelberg.

The DIMA Model

A set of agents $A = \{a_1, ..., a_n\}$

Each *agent* has a list of personal characteristics $P_a = [c_1, ..., c_n] : c \in C$

A set of social groups **SG**, each with a list of <u>prototypical characteristics</u> $SG_i = [c_1, ..., c_n] : c \in C$

Core Problem

To determine if in a **situation** an *agent* should use its <mark>personal identity</mark> or a <mark>social identity</mark> (i.e. to act as an individual or as a member of a social group)

The DIMA Model

Set of **identities**

    One <mark>personal identity</mark> per **agent**

    One <mark>social identity</mark> per **social group**

        Agents have an **accessibility** value per social identity

Each **agent** may have more than one **social identity**

Determine the <mark>active identity</mark> congruent with the **context**

    One of the above (<u>personal</u> or <u>social</u>)

The DIMA Model

==Context== is defined by

The **agents** present (<u>who</u>)

may be brought to context by reference

The **theme** (<u>what</u>, <u>where</u>, <u>when</u>)

topic, place, event $\rightarrow$ a set of characteristics $T = [c_1,..,c_n]$

The ==active identity== is the **most salient one**

The DIMA Model

$$salience\ (SI, a, context) = fitSI_{,context} \times accessibility_{SI,a}$$

Fit: fits the situation (comparative and normative)

Accessibility: recall past experiences, emotional relevance/attachment

The DIMA Model

Computing the <mark>salience</mark>

The context **theme** filters the relevant <u>personal characteristics</u>

Agents are described only by a subset of **P$_a$**(normalized values [0-100])
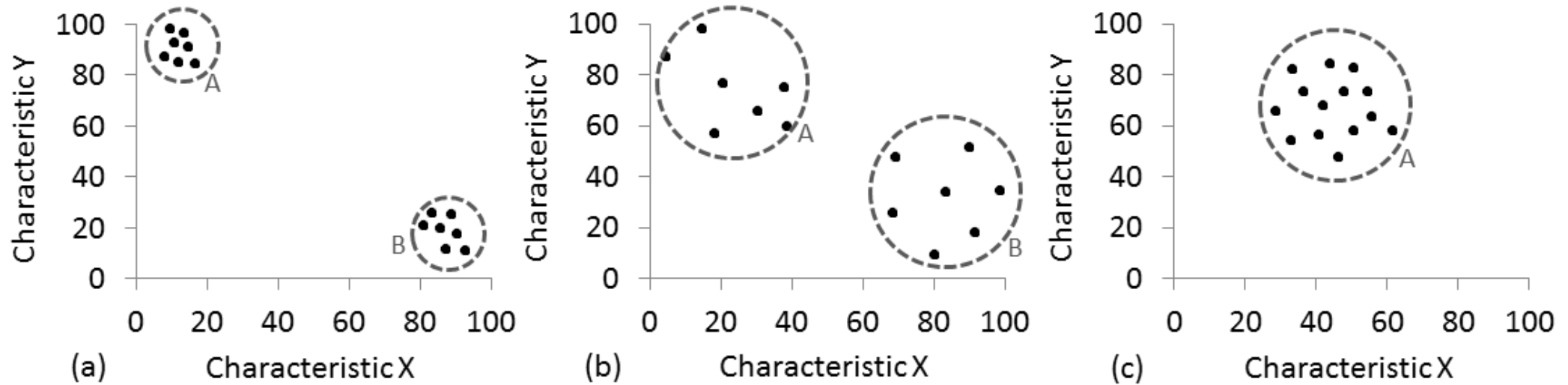
<u>Clustering</u> algorithm to find **social groups** (e.g. KNN)

Compute **comparative fit**

$$\textbf{fit } = \alpha \times distance(SG_{in}, SGou_t) +$$
$$(1 - \alpha)\,(\beta \times dispersion\,(SG_{in}) + (1 - \beta) \times dispersion\,(SG_{out}))$$

(α and β) = [0-1] are meta-parameters

The DIMA Model

salience (a) > salience (b) > salience (c) = 0

The DIMA Model

If <u>more than one</u> **social group** is identified in the <mark>context</mark>

Try to recall the **normative** <mark>social identity</mark>

$$NormSG = arg\ (distance(SG_k, SGin) < th):\ SGk\ in\ agent's\ KB$$

$$IF\ NormSG \neq \emptyset, the\ \textbf{salient identity} = argmax\ (accessibility(SGn))$$

$$IF\ NormSG \neq \emptyset, then\ the\ agent\ is\ in\ the\ presence\ of\ a\ new\ social\ group\ (\textit{ad-hoc,}$$
$$non\ normative),\ the\ \textbf{salient identity} = centroid(SGin)$$

The DIMA Model

Active Identity = <u>personal</u> identity $\rightarrow_{\textbf{(salience)}}$ salient <u>social</u> identity

E.g. if the salience is above a threshold the **active identity** is the <mark>social identity</mark>

If <u>only one social group</u> is identified in the context, the **active identity** is the <mark>personal identity</mark>

The DIMA Model

The ==agent's decisions== are based on

  The **characteristics** of the <u>active identity</u>

  The **salience** of the <u>social identity</u>

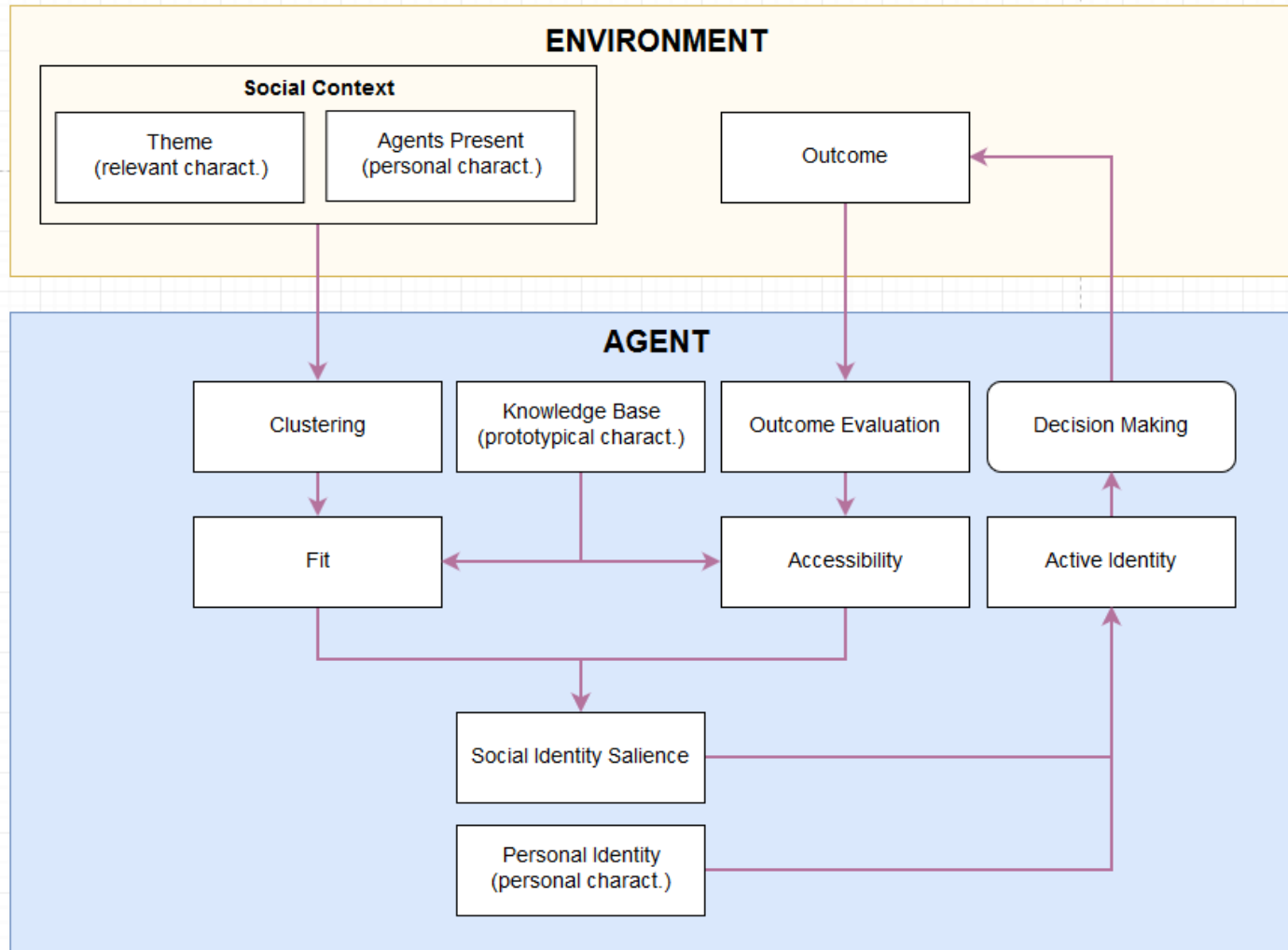 The **membership** regarding SG_{in} and SG_{out}

  The **prototypical** characteristics of the **others**

After taking an action the **emotional relevance** of the outcome is assessed

The ==accessibility== of the **social identity** is updated

$$accessibility\ (SG_{in})_{t\ +\ 1\ =}\ accessibilty(SG_{in})_t + emotRelev(outcome)_t \times salience(SGin)_t$$

The DIMA Model

Application to a Dictator Game

Repeated multi-agent **dictator game**

offer = base $\pm$ f(==salience==(SI)) – <u>ingroup</u> / <u>outgroup</u> bias

10 agents (two groups)

Varying size of groups (*5 vs 5, 4 vs 6* and *2 vs 8*)

==Results==

Salience of social identity of <u>smaller groups</u> was **higher**
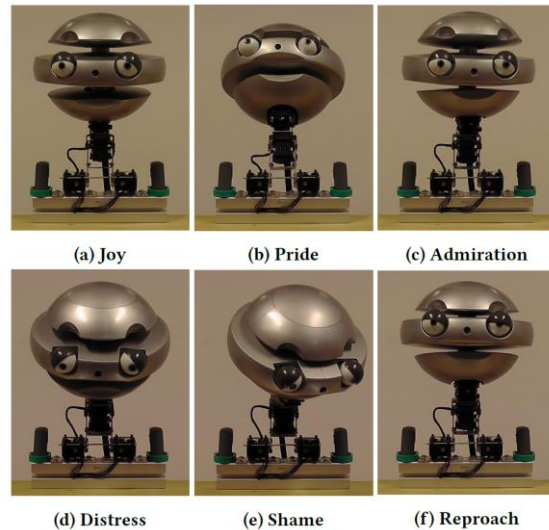
Accumulated **wealth** of <u>smaller groups</u> was **higher**

Effects of **ingroup favouritism** are stronger

Group based emotions[1]

Displaying ==emotions== as **individual** or **group**

Determine the **cognitive unit** for the <u>emotional appraisal</u>

(a) Joy   (b) Pride   (c) Admiration
(d) Distress   (e) Shame   (f) Reproach

Positive effects for group identification, trust and likability

[1]Filipa Correia, Samuel Mascarenhas, Rui Prada, Francisco S. Melo, Ana Paiva: "Group-based emotions in teams of humans and robots" in proceedings of HRI'18 - International Conference on Human-Robot Interaction, pp. 261-269, Chicago, IL, USA, March 2018. ACM/IEEE.
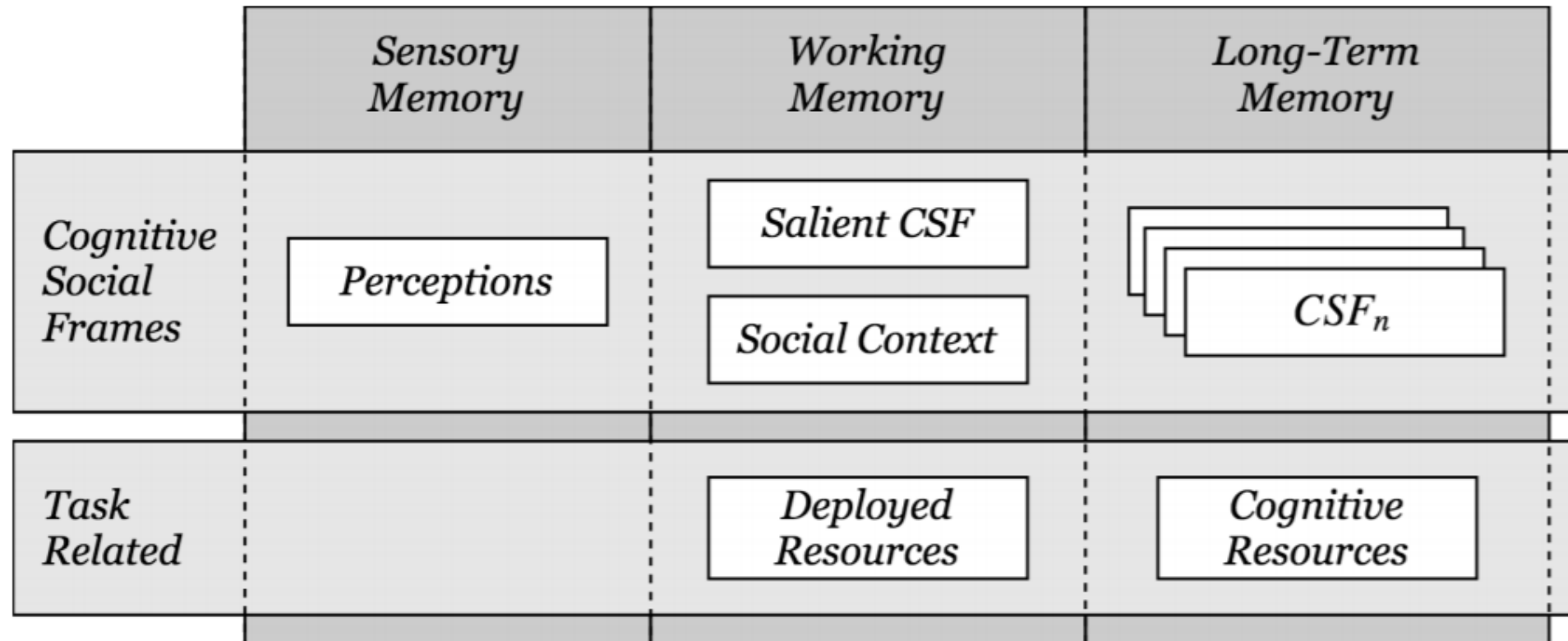
The DIMA Model

Limitations

- The comparative fit is predominant
- Works better with ad-hoc social identities (minimal group paradigm)
- The context theme is directly defined by a set of characteristics
  - Need to improve the definition of contextual features
- The personal identity and social identity characteristics belong to the same set and are of numeric in nature
  - Better support for (cognitive) social features

Cognitive Social Frames[1]

	Sensory Memory	Working Memory	Long-Term Memory
Cognitive Social Frames	Perceptions	Salient CSF / Social Context	CSF_n
Task Related		Deployed Resources	Cognitive Resources

[1]Rato, Diogo, Samuel Mascarenhas, and Rui Prada. "Towards Social Identity in Socio-Cognitive Agents." *arXiv preprint arXiv:2001.07142* (2020).

Ideas for the future

- Use self-esteem as a driving force of social agents

- Explore optimal distinctiveness theory

- Social identity and inter-personal relationships

Thank you

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