

# Normative Multi-Agent Systems and Human-Robot Interaction

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## Aim

We seek to identify opportunities for cross-fertilisation between the normative multi-agent systems (NorMAS) and robotics research communities.

## Normative Multi-Agent Systems

- Active research area for almost 30 years [1].
- Publications in AAMAS, JAAMAS, NorMAS, COINE, DEON, JURIX, and general AI venues.
- Key questions:
  - How can norms promote social order in societies of autonomous agents?
  - How can agents identify, represent and reason about norms?

Selected areas of NorMAS research are outlined below.

## What is the Lifecycle of Norms?



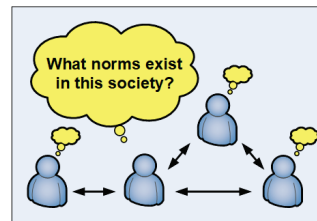
Norms emerge, spread, become recognised by society, and may later become obsolete. Agents should be able to track their status.

## Norm-Aware Practical Reasoning



How do norms affect agent planning?

## Norm Identification



How can agents learn norms from observation?

## Cross Fertilisation with Robotics

### Moving Beyond Simulation

Most NorMAS research uses simulations. Robotics applications will provide richer use cases.

### Extending Norm-Aware Practical Reasoning

NorMAS techniques for norm-aware practical reasoning mechanisms could be extended to handle robotics requirements, e.g. path planning.

## Norm Conflicts in Social Robotics



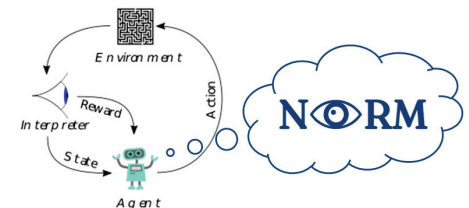
Multi-purpose robots will need norms for many contexts, which may overlap. Conflicting norms may result. There is NorMAS research in this area.

## Robots as Norm Entrepreneurs



Robots could act as *norm entrepreneurs*, or assist human norm entrepreneurs. NorMAS work on *norm synthesis* could be adapted.

## Fast and Slow Normative Reasoning



Robotic applications will need “fast” and “slow” reasoning, e.g. reactive vs. reasoned choice of actions

## Reference

[1] Yoav Shoham et al. “On the Synthesis of Useful Social Laws for Artificial Agent Societies (Preliminary Report)”. In: *AAAI'92*. 1992.