

Digital Ledger Technology, Social Contracts and the design of Cyber-Physical Systems

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Monday 21 June 2021

2pm

Via Microsoft Teams

Abstract:

We describe how Distributed Ledger Technologies can be used to enforce social contracts and to orchestrate the behaviour of agents trying to access a shared resource. Social contracts are rules and social conventions that govern what is deemed to be good behaviour when agents interact with an environment. Unfortunately, many of these rules are either poorly designed, leading to inefficient/unfair allocation of resources, or were conceptualised when technology did not permit personalised feedback (nudges) to reward good behaviour. The first part of the talk will discuss the advantages and disadvantages of using Distributed Ledger Technologies architectures to implement certain control systems for such applications. We then focus on a specific type of DLT based on a Directed Acyclic Graph (DAG). In this setting we propose a set of delay differential equations to describe the dynamical behaviour of a specific DAG based distributed ledger. The final part of the talk discusses the design of social contracts and their design based on the use of DLT's. Specifically, we present a scheme to price personalised risk in sharing economy applications. We provide proofs for the convergence of the proposed stochastic system and highlight several applications of our technology.