

# Electronic Trading Environments for Web 3.0

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**Abstract.** This paper proposes that electronic marketplaces for Web 3.0 can be described through three metaphors: “marketplaces where people are”, “marketplaces that are alive and engaging”, and “market places where information is valuable and useful”. The paper presents the core technologies that enable the perceivable reality of electronic marketplaces. It describes a demonstrable prototype of a Web-based electronic marketplace that integrates these technologies. This is part of a larger project that aims to make informed automated trading an enjoyable reality of Web 3.0.

## 1 Introduction

A market is commonly defined as a physical or virtual location, where price is determined and buy and sell orders are matched to create trades according to a set of rules that govern the processing of these orders [1]. Electronic markets have been viewed as information systems “that allow buyers and vendors to exchange information about prices and product offerings [2]. This and similar views have guided the development of “soulless” electronic markets, focussed primarily on enabling standardised or complex transaction processes. Thus automation of electronic markets have been focused on the secure backend transaction processing. A recent review of the area (see Chapter 18 “Electronic Marketplaces and Resource Exchanges” in [3]) provides a broader picture from various perspectives, including agent-based negotiation, brokering, and partnership formation. Still, the operation and the interactions in such Web-based electronic markets reflect the dominating content-based systems approach of Web 2.0. Though useful, these electronic markets are far from being realistic trading places.

In this paper we consider electronic (virtual) marketplace to be a regulated space populated by computerised players that represent a variety of human and software traders, intermediaries, and information and infrastructure providers. Such marketplace is where things and traders have presence, constituting a rich interaction space [4]. The agreed regulations operating in the space structure the interactions between the different contributors. We borrow the metaphor from [5].

### 1.1 Electronic Marketplaces for Web 3.0

Electronic marketplaces for Web 3.0 should attempt to model the full richness of interactions including natural language communication, gestures, and emotional expression, as well as the cognitive apparatus that underlies these capabilities [6]. Most virtual human research has focused on the cognitive behaviour on the source side of the interaction [7] with a recent shift towards the “recipient” [8].

One inspiring contribution is the Carnegie-Mellon set of requirements for realistic agents, which is based on research in drama and story telling [9]. These include personality, self-motivation, change, social relationships, and “illusion of life”. Personality infuses everything that a character does — their behaviour, style, “thought”, “emotion”, e.g. their unique ways of doing things. Self-motivation assumes that agents have their own internal drives and desires which they pursue whether or not others are interacting with them, and they demonstrate their motivation. Change implies that characters change with time, in a manner consistent with their personality. Behaviour of agents and interactions between them should be in a manner consistent with their social relationships (in turn, these relationships change as a result of the interaction). “Illusion of life” is used as a label for a collection of features such as: pursuing multiple, simultaneous goals and actions, having elements of broad capabilities (e.g. movement, perception, memory, language), and reacting quickly to stimuli in the environment. In this sense convincing does not necessarily mean realistic. We discuss briefly the issues in the Carnegie-Mellon set of features:

**Regulations:** Norms are part of interactions between trading partners. Collectively they constitute a complex, structured, regulatory system that should be consistent. In a convincing trading environment, in addition to compliance with regulations, some times there could be some modifications based on mutual agreements. Background details to the operationalisation of norms in 3D virtual spaces are considered in [10].

**Processes:** The structure of the business processes in electronic markets define the narrative of the marketplace. Market players operate in the context of the process structures under the constraints of the regulatory framework.

**Spaces:** Humans are embodied in space in all their behaviour. They inhabit and operate in it; rely on and use various cues related to space, like pointing and referring to areas of and things in it (for more details see the first two chapters in [11]). This is an essential factor driving the technological conquest for moving us from being on the Internet to gradually being in the Internet space, i.e. towards what is labelled 3D Internet [12]. The evolution relies on several technologies that enable primarily perceptual immersion, including virtual worlds and immersive access to digital content [13]). In terms of the realism of electronic environments, the virtual space is essential part of what constitutes an *intelligent environment populated with intelligent artefacts*. Intuitively, to be realistic electronic markets should have arrangement of their virtual spaces that are aligned with the business processes in them.

**Interactions:** As a result of their capability to dig out and paste together various pieces of useful information, traders usually are informed to a different