An Initial Agent Based Model for Innovation Ecosystems

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The global economies have been trying various methods of investments in innovation to raise productivity, create jobs and improve life standards. For the same purpose, the United States has long been supporting the foundation of basic research and innovation for technological advances, which generate wealth over time. The productivity gains through technological advancements, labor specialization and innovation have been articulated by evolutionary economists since the middle of the twentieth century [1, 2]. However, it is still open to research how certain innovation ecosystems such as Silicon Valley are extremely productive and grow continuously while other similar systems languish. Therefore it is critical for the national economic well-being to study, understand and more efficiently create the innovation ecosystems.

The economic entities in an innovation ecosystem are intertwined such that the success of an innovation depends not only on the innovating entities, but also on the suppliers and consumers of those entities. All of the members of an ecosystem coevolve and the innovations of an entity result in the innovations of others [3]. Over time, the technology space of the ecosystem changes in response to the innovations. In order to reflect these characteristics, we aim to model the innovation ecosystems as non-linear, complex adaptive networks in which economic agents are connected by social networks and compete, cooperate and adapt to each other's needs forming unplanned consequences in the network. The goal of creating such a model is to improve the understanding of innovation ecosystem dynamics using agent-based computational economics to inform policy makers and test policy hypotheses.

In this paper, we first explore the state of the art agent-based innovation ecosystem models and work on the compartmentalization of these models. In particular, we classify the models in terms of their simulation methods, objectives and approaches in the adoption of stochastic processes [4, 5]. Then we present our bottom-up approach to create our model and conduct simplistic experiments, whose purpose is to illustrate the initial ideas behind the model framework, rather than to accurately describe the whole innovation ecosystem. As we focus on a system in which the agents interact and compete, we study the basic minimal ecosystem dynamics of our model by comparing its behavior to systems with trophic functions [6, 7]. Overall, this study 1) demonstrates the critical points in innovation ecosystem models including current theoretical and methodological contributions; and 2) identifies the position of our approach in the classification of models and studies its minimal ecosystem dynamics.

References

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