Referencer: A Collaborative Online Space for Multidisciplinary Modeling

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Extended Abstract. We introduce in this presentation a collaborative, online space designed over the past three years to facilitate multidisciplinary and transdisciplinary model-building. Referencer is a web-based tool with space for researchers to organize data, theory, literature, analyses, and assumptions—as well as event timelines and location-based maps—to develop collaborative, traceable model conceptualizations and designs. Motivation for the design of this platform originates in the attempts to cross the disciplines of social science and engineering to develop agent-based models of grassroots humanitarian organizing during refugee situations. The difficulty in managing such collaborations is that ethnographers conceptualize their models as narratives, and these are not easily converted into simulation models. Creating a system where all team researchers could upload data, insights, theory, and candidate model specifications is useful for centering a discussion across disciplines to convert narrative to ABM.

Traceability of models is particularly useful in the development of social science models, where data to inform models can come from qualitative, sometimes ethnographic observational data, and tie in complex ways to elements of a model's design. For instance, fieldnotes might be captured like Fig. 1 below in Referencer, which allows for the researcher to tie field observations with commonly referenced events (orange) and locations (gray) to links for outside sources (bright green) and different interviewed actors (purple). These elements can then be tied to concepts/factors (dark green) and annotated with notes (white boxes) and causal relationships (named linkages). From this step, one can create a representation of the fieldnotes as a model, even using UML in another tab to document the actors, factors, and causal mechanisms captured in the model.

Among the many uses of Referencer, this allows modelers to go back to the original data and assumptions that underlie elements of the models, and to trace those elements back to their original sources (including assumptions and theory). Even prototype models can be included in the Referencer workspace to ensure that they are tied to the elements of data they represent, and documentation is stored in a place that enhances multidisciplinary sharing and collaboration.

Referencer is not itself a modeling platform like NetLogo or AnyLogic. Rather, it is a starting place from which to collaborate on the conceptualization—including documentation—of models that may require the combination of many different data types, including qualitative, quantitative, and even visual and geographic, into one model design.

Because images and text documents can also be uploaded to Referencer, it takes model traceability to a whole new level, where coding and some AI-assisted analysis of text data can aid even those unfamiliar with modeling paradigms in structuring causal diagrams that can be translated into simulation models. Some users have used these data visualization features to develop conceptualization models of events timelines from social media data, which can then form the basis of a simulation model (Fig. 2).

The usefulness of such a tool is not only developing traceable simulation models using disparate data types—qualitative, quantitative, location, and others. It also extremely useful in facilitating the collaborative model conceptualization space that allows for multidisciplinary teams to contribute to the centralized data storage and mapping to model concepts (such as actors, factors, and causal relationships) that allow the co-creation of simulation models.
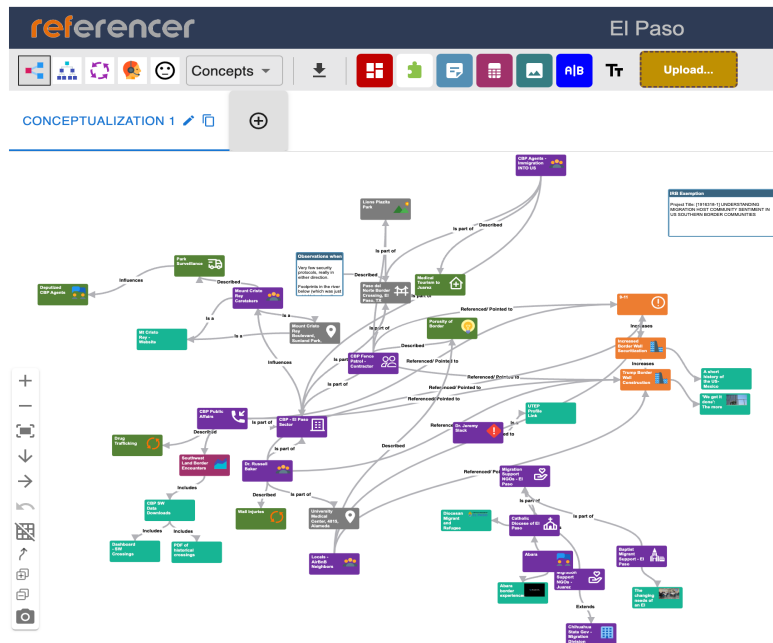
Fig. 1. Example of Qualitative, Ethnographic Fieldnotes in Referencer
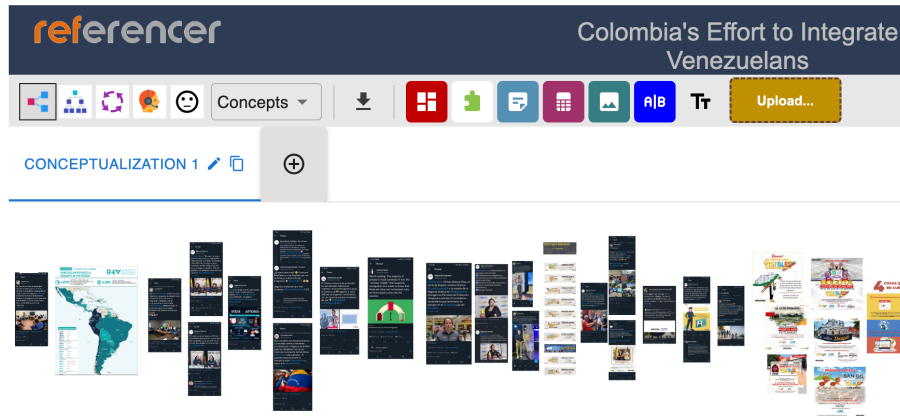
Fig. 2. Visual Data Organized in Timeline to Conceptualize a Model

Keywords: Social Simulation Models, Model Traceability, Multidisciplinary Model-Building