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Building an Opinion Dynamics Model from Experimental Data

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Abstract : Opinion dynamics is a sub-field of agent-based modeling that focuses on people's opinions and their evolutions over time. Despite the rapid increase in the number of publications in this field, it is still not clear how to apply these models to real-world scenarios. Indeed, there is no agreement on how people update their opinion while interacting. Furthermore, it is not clear if different topics will show the same dynamics (e.g., more polarized topics may behave differently). These problems are mostly due to the lack of experimental validation of the models. Some previous studies started bridging this gap in the literature by directly measuring people's opinions before and after the interaction. However, these experiments force people to express their opinion as a number instead of using natural language (and then, eventually, encoding it as numbers). This is not the way people normally interact, and it may strongly alter the measured dynamics. Another limitation of these studies is that they usually average all the topics together, without checking if different topics may show different dynamics. In our work, we collected data from 200 participants on 5 unpolarized topics. Participants expressed their opinions in natural language ("agree" or "disagree"). We also measured the certainty of their answer, expressed as a number between 1 and 10. However, this value was not shown to other participants to keep the interaction based on natural language. We then showed the opinion (and not the certainty) of another participant and, after a distraction task, we repeated the measurement. To make the data compatible with opinion dynamics models, we multiplied opinion and certainty to obtain a new parameter (here called "continuous opinion") ranging from -10 to +10 (using agree=1 and disagree=-1). We firstly checked the 5 topics individually, finding that all of them behaved in a similar way despite having different initial opinions distributions. This suggested that the same model could be applied for different unpolarized topics. We also observed that people tend to maintain similar levels of certainty, even when they changed their opinion. This is a strong violation of what is suggested from common models, where people starting at, for example, +8, will first move towards 0 instead of directly jumping to -8. We also observed social influence, meaning that people exposed with "agree" were more likely to move to higher levels of continuous opinion, while people exposed with "disagree" were more likely to move to lower levels. However, we also observed that the effect of influence was smaller than the effect of random fluctuations. Also, this configuration is different from standard models, where noise, when present, is usually much smaller than the effect of social influence. Starting from this, we built an opinion dynamics model that explains more than 80% of data variance. This model was also able to show the natural conversion of polarization from unpolarized states. This experimental approach offers a new way to build models grounded on experimental data. Furthermore, the model offers new insight into the fundamental terms of opinion dynamics models.

Keywords : experimental validation, micro-dynamics rule, opinion dynamics, update rule
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