Approval and participation index for ternary voting (approve, disapprove, indifferent) adequate to random proposal entry.

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In finding the adequate way to prioritize proposals, given they are voted *approved*, *disapprove* and *no opinion*, the Brazilian participation community agreed about a approval index and a participation index. Both practice and literature is constantly handled by the experts involved, and the formalization of such model seems novel, maybe because of its triviality. Even so, the relevance of this report relies in the nearby use of these indexes to raise and prioritize proposals about public health care by the Brazilian Federal Portal of Social Participation.

social participation | recommendation systems | online voting | statistics

Abbreviations: PyPI, python package index

Online decision making is a kind of recommendation system with special appeal for online participation and electronic governments. This poses challenges on the design of such processes regarding validity, security and the adequate indicators. Indeed, the processes themselves vary, and the fact that the ranking indexes presented here seems not to be formalized and published is an evidence that such online decision is very recent phenomena.

This incidence of online voting has the following characteristics:

- Proposals might be inserted by voters after the voting phase started.
- A proposal is presented to a voter one by one as random outcomes of all proposals.
- Votes might be "approve", "disapprove" and "indifferent".
- Voters vote without authentication.

This setting requires care about security and validity. Some of which are:

- Adequate estimates of threshold for statistical validity of ranking.
- Keeping the IP of voters to detect automated and other fraudulent efforts.
- The use of the outcomes. This requires probing the survey being conducted and its purposes. Current indexes are being used to deliver indicatives for the Brazilian federal government of most important proposals about health care. As these are not authenticated voting, they might be regarded as a reference document if data is minimally shared and checked for inadequate data entry.

Approval and participation indexes. The approval index α_i and the participation index γ_i of the proposal i is defined as:

$$\begin{aligned} \alpha_i &= \frac{v_i^+ - v_i^-}{\eta_i} \\ \gamma_i &= \frac{v_i^+ + v_i^-}{\eta_i} \end{aligned} \qquad [1]$$

where v_i^+, v_i^- and η_i are approval count, disapproval count and exhibition count, respectively. Note that $\eta_i - v_i^+ - v_i^-$ is the count the "indifferent" manifestations received by proposal i. Also, note that accepted sampling estimates error, η_i is expected to be constant above a minimum threshold.

Selected decision framework examples. Many of the online decision processes conceived and practiced resemble our model and have related indexes. This section presents a collection of models more familiar to the Brazilian participatory community, with focus on the mechanisms not on historical notes.

Pairwise is part of the tackled paradigm: the raking procedure accepts new proposals while the voting occurs. Pairwise voting is comparative, voter chooses between two proposals, and this does not fit proposed procedure.

Appgree software ranks voting by sampling voters in cycles each with fewer proposals. This is adequate for decision making and showcases statistical estimates utility. The system relies on an organized group engagement and identities, which also does not fit current needs.

Liquid Feedback is a very renowned and bleeding edge solution for collective decision making. It relies on delegating your voting count on specific subjects to other people you know or trust. Therefore, it does not fit current needs. This framework have precious considerations for our case, such as about raking and presenting proposals to voters in the most useful ways.

A Brazilian solution, used in diverse software and specially important as the output as a nation-wide decision making need, is the Agora Algorithm. It presents a decision procedure based on agenda with steps (proposition, argumentation, voting) and posting types (comment, proposal). Although coherent, this framework requires authentication and might need

experimentation and tuning so to achieve desired use to more than dozens or hundreds of participants.

There is a number of solutions for online collaborative prioritization, such as IdeaScale, Kidling, or any flavor of an Analytic Hierarchy Process (AHP). Authors hope to better formalize possible solutions (and which are found implemented), maybe through recommendation systems theory [**?**].

Discussion

These are the best estimates the researchers designed, which were more suitable for current needs than solutions found in literature. The following questions should be answered in near future:

- Are there more adequate measures for ranking proposals in the given setting?
- What are strong and weak aspects of the approach for collective recommendation?
- Are there really no previous formalized solution to this problem in the exact setting? If there is, what comparisons can we make from design and outcomes?
- To which extent will participation community and public managers legitimize this approach?

Most importantly, this report is being delivered to the civil society and scientific community for consideration. Given the large number of possibilities for the collective ranking procedure, and the proliferation of solutions, research efforts might aim the classification of such procedures.

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