LIVOS: BACHELOR PROJECT PRESENTATION

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SUMMARY:

• Introduction (what is livos, usefulness, goal, challenges)
• Implementation (structure, website, simulations)
• Simulation (Survey, Circle, Tyrant, Markov, Quadratic Voting)
• Results (Liquid accuracy impact)
• Conclusion
INTRODUCTION: WHAT IS LIVOS?

- Research project based upon Liquid Democracy
- Liquidity
- Delegation
- Proof of concept of E-voting system
USEFULNESS OF THE PROJECT

• Major problem: not yet applied in real systems. (Digital Liquid Democracy)

• Theory is ready.

• Missing part: to provide more effort into working on a realist implementation of a Liquid Democratic voting system.
GOAL OF THE PROJECT

• Proof of Concept of integration of a Liquid system in «real» simulations

• Does Liquid Democracy bring major changes to the results?

• Basis for future studies

• Comes with interrogations:
  • Circle delegation, Tyrant problems
  • Minorities and the balance of voting power
CHALLENGES

• Drop Security and federated aspect to mainly focus on the Liquid/Delegation part. (First ideas were too ambitious)

• Implementation of the liquid democracy:
  • more complex than traditional
  • simulating the behavior of a voter

Results:
- Yes: 100 + 125 = 225
- No: 75

Yes: 75%
No: 25%
SIMULATION DESIGN

• Blank vote and abstention-vote
• Maximum number of actions
• Simulation rounding problems
• Transitivity of delegation
IMPLEMENTATION:

• Key words: VotingSystem, VotingInstance, VotingConfig, Users

• Server and web application : DEMONSTRATION
  • Tool that is implemented, ready to be used for a real (centralized) experiment.

• Simulations with the GraphViz library (see next slide)
Votation Diagram of 19 nodes. Results are: IC = 30 %, SV = 27.33 %, MECA = 20.67 %, MICRO = 22 %.

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Il y a 3 CandidateVoter, 3 Threshold Voters, 1 NonResponsibleVoter, 4 ResponsibleVoter, 4 IndecisiveVoter and 0 NormalVoter.
**SIMULATION: SURVEY**

- **Objective:** Categorize voters specific behaviors

- Run simulation with (limited) set of datas closest to the reality

- Urge to make Liquid Democracy popular
DIFFERENT VOTER CATEGORIES

And last but not least: Do you recognize yourself in one or more of the following categories (you can add a new category if you don’t feel belonging to any):

102 réponses

- Engaged voter: you often have a strong opinion on... - 27 (26.5%)
- Indecisive voter: you sometimes have a strong opinion on... - 37 (36.3%)
- Uninformed voter: you usually have a strong opinion on... - 24 (23.5%)
- Responsible voter: you'll continue to have a strong opinion on... - 46 (45.1%)
- Shy voter: you are not comfortable... - 5 (4.9%)
- Medium voter: combination of... - 19 (18.6%)
CIRCULAR DELEGATION PROBLEM

• Awareness of a cycle then take a decision (to break it).

• How ? Notification system : come back to the website to vote again
COULD WE AUTOMATE THIS PROCESS TO BE MORE USER-FRIENDLY?

• Voters should fill in form to describe their behavior in various situations (situations, conditions, parameters change drastically the decisions)

• Fit people into categories doesn’t always represent the reality and is in fact not more user-friendly

• Another path that: running simulations with preference lists
TYRANT PROBLEMS

• We might think that with the delegation process some tyrant with too much voting power can be created.

• Either by a chain of delegation:
  • broken by responsible voters
  As they are as many chance to break the chain
TYRANT PROBLEMS

• If everyone delegates to one person:
  • seems unrealistic as you often delegates to someone different.

Let's say there is a situation where you know NOTHING about the subject of the votation and its implications and you don’t have time to learn about it. What would be your top 3 actions?

102 responses

- Delegating to a professional concerning the subject: 35.3%
- Delegating to a trustworthy person you know (family or friends...): 13.7%
- Delegating to the political party you support/follow: 11.8%
- Don’t vote: 7.3%
- Vote 50%, 50% (in a referendum): 3.4%
- Other: 30.4%
MARKOV CHAINS

• New result counting method:
  Elect not the most voted candidate but the one that best suits the most people.
  The liquidity = tool to count differently the results

• Example: Voter 1 voted for 60% to A, 30% to B and 10% to C.

• Mathematical tool of Markov to solve this and get that B should be the winner.
LIQUID QUADRATIC VOTING:

- Another way of counting the results.
- Favors vote splitting and thus encourage liquidity.
RESULTS:

- Liquid accuracy impact measured with:
  - Election with candidates
  - Referendums (yes/no)
  - Survey data (with and without Indecisive voters: blank vote)
  - Number of voters
  - Balanced / Unbalanced votes
LIQUID ACCURACY (ELECTIONS)

• Up to 20% precision loss when using a traditional system (stays almost constant due to indecisive voters: ~19.5%)

• Without indecisive voters: 5%-8% then drop of the accuracy (when adding voters)

• No difference between balanced and unbalanced elections
LIQUID ACCURACY (REFERENDUMS)

- Up to 18% precision loss when using a traditional system (stays almost constant due to indecisive voters)
- Without indecisive voters Balanced: 4% then drop of the accuracy (when adding voters)
- Non-balanced (2 sorts): impact of accuracy stays constant (slight decrease ~1% loss from 100 to 10,000 voters)
LIQUID QUADRATIC VOTING

• Without indecisive voters: 2.7% then quick drop of the accuracy (when adding voters)

• With indecisive voters: 4.2% then quick drop of the accuracy.

<table>
<thead>
<tr>
<th>Quadratic Impact 4 Candidates</th>
<th>Realist Data</th>
<th>Realist Data without Indecisive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balanced (50% each, and equal number of YesVoter and NoVoter)</td>
<td>100 voters: 4.27% (1,000 simulations)</td>
<td>100 voters: 2.74% (1,000 simulations)</td>
</tr>
<tr>
<td></td>
<td>1,000 voters: 1.40% (100 simulations)</td>
<td>1,000 voters: 0.86% (200 simulations)</td>
</tr>
<tr>
<td></td>
<td>10,000 voters: 0.41% (4 simulations)</td>
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</tbody>
</table>

• Strongly relative to the design of the system and our data.
CONCLUSION

• Liquid Democracy can be used in every democratic systems.

• People are more involved, the results can be up to 20% more accurate (under specific conditions)

• This project provides a system that implements Liquid Voting and provides different ways to interact with it as the website or the simulations.

• For the future, LIVOS project can be improved in many ways:
  • User-friendliness of the e-voting system, keep the balance between automation of the process and precision of the result with few solicitation of the user.
  • A Federated architecture
  • Security and usability of the web application thought proper authentication and remote access.
  • Display more information and give more options in the website to diverse the system.
  • More parameters to the simulations (such as the age of the participant...)

THANK YOU!