Flexible Voting

Miroslav Hudec
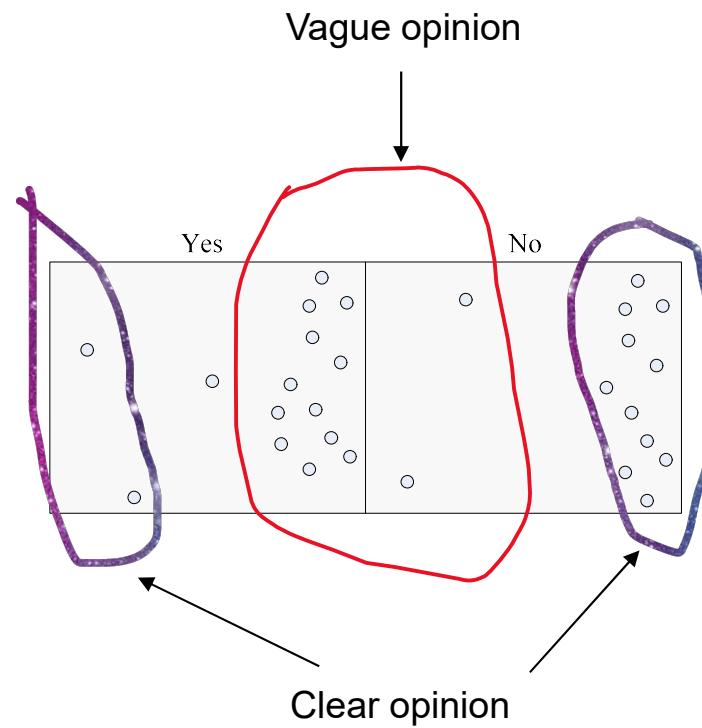
VSB – Technical University of Ostrava

Presentation roadmap

- General overview of the idea
- Flexible referendum
- Flexible voting in *smart* cities
- Conclusion

Classical referendum voting issues

Vague opinion

Yes

No

Clear opinion

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Referendum case

Binary voting, or referendum, is a broadly used way for reaching decisions in direct democracy. It is a well-established and easily applied approach (also in the mathematical and statistical sense).

Possible situations

49.5 % strongly for *No*, 50.5 % weakly for *Yes*, result is **Yes - Reflects it reality correctly?**

49.5 % strongly for *No*, 50.5 % strongly for *Yes,* result is **Yes** – *a high polarization in society*

49.5 % weakly for *No*, 50.5 % weakly for *Yes,* result is **Yes** – *a non-polarization in society*

But it remains hidden in binary bullets.

Participation

Switzerland is often cited as a democratic role model, but whose citizens in most cases participate at less than 50% at municipal, cantonal and federal level.

Motivation?

Cooperation with the Bern University of Applied Sciences and University of Fribourg.

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Problem

In referendum type voting, how am I sure for Yes or No? If we collect also incitation, does it bring something?

In a local voting, like development in a city, people might have different intensities of accepting or rejecting the proposal. In addition, when we ask both options, we might find more and less reliable answers.

In local voting, like construction, different groups might be differently influenced, e.g., distance to construction or belonging to diverse categories like commuters, people living there and relatives living there. In many cases, approaches like weighted means are oversimplified.

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Observation

People cannot always clearly express their vote in a binary way; people percept more than only "black or white" i.e., people do not always know if they fully agree or disagree. People might accept expressing vote by non-sharp way.

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Main idea from

Prof. Lotfi Zadeh a mathematician from Berkeley University. Developed sets with flexible boundaries and fuzzy logic (1965) to cover mainly concepts in economy and social sciences. But the first successful applications in technical field (1975).

Prof. Andreas Meier a mathematician from ETH Zurich and musician from Vienna conservatorium (2012). Why not to try this in voting?

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Experiments

To address this research idea, an experiment with a sample of voters against the background of a real-life referendum was launched in autumn 2022 in Switzerland.

In November 2022, 104,260 voters in the Swiss city state of Basel were called upon to decide in a referendum on climate policy measures.

Schwarz D., Emmenegger B., Fivaz J., Hudec M., Portmann E. (2024) Effects of fuzzy voting on citizen participation: Empirical evidence from Switzerland. Tenth International Conference on eDemocracy & eGovernment (ICEDEG 2024), Lucerne, Switzerland, 24 - 26 June 2024. Accepted.

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Recording answers

In electronic forms, adjusting the position of slider by respondent

No	Maybe	Yes
0	0.5	1

Position of slider in
web form, for exampe
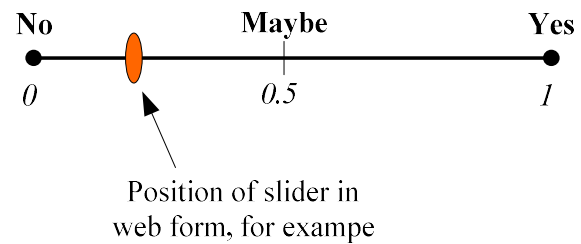
In classical form, scanning marked position by respondent

Voters sample for both ways

	Undecidedness before votes		
	(almost) never	*occasionally*	*often*
"The scale-based method better reflects the political position of voters."	58.1%	74.5%	72.3%
"The current voting procedure works well, so an adjustment is unnecessary."	76.6%	64.5%	31.9%
"The scale-based process makes it easier for voters to make a decision."	27.9%	44.0%	54.2%
"The scale-based process makes voting more complicated and overwhelms people."	80.4%	77.0%	66.5%

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Result

By the arithmetic mean (the only logically neutral aggregation function) the result *R* is calculated.

When R < 0.5 ⟹ result is *No*

When R > 0.5 ⟹ result is *Yes*

When R = 0.5? The same as when in classical referendum the equal number of *yes* and *no* answers is collected, but it is less probable.

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Story telling

The further benefit of flexible voting is story telling of respondents opinions. By mathematically formalizing elastic quantifiers adverbs and adjectives, further information is revealed, for instance:

- *most of respondents are around the neutral point,*
- *about half is strongly for yes, whereas about half is strongly for no*

(both expressing solution near 0.5)

Collecting further data like age and gender, storytelling is more detailed like

most of young are strongly for yes, about half of middle-aged are indecisive and most of older are for no

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Story telling

By adopting so-called quality measure of summarized sentences among regions in a country we can reveal sentences like:

about a quarter of districts are strongly for yes, about half of districts are lightly for no, about a quarter of districts are weakly for yes.

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Local voting

Do you agree for building five blocks of flats of 10 floors each on location L?

If there are only two answer options, it is difficult to sense the citizens in a certain context for the city. However, if there would be a flexible voting, with intensities a light disagreement might indicate that the investment plan is acceptable, but with a reduced building density, whereas a high disapproval indicates that citizens are against the investment plan in general.

Citizens are living in the affected areas, citizens commuting to the affected areas, citizens having relations in the affected areas ...

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Summarized information from the data – story telling

Example 1

An editor of a fashion journal sent journalist to the party to see, whether *most of young and tall persons wear green shirts*. Vague question, but clear; a short observation by an experienced eye is sufficient.

Example 2

Another journalist should find, whether *most of young commuters commute medium distance*
Data are in a (large) dataset. Is an experienced eye sufficient? Is a usual database query method sufficient?

Ask data to receive a short story. Is it AI? Not at all, just applying well-known mathematical concepts like flexible sets and quantifiers.

Our references

Hudec M., Portmann E., D'Onofrio S., Torres van Grinsven V. (2021) A flexible voting approach for supporting more accurate decisions. *New Techniques and Technologies for Statistics (NTTS 2021)*. European Commission, Brussels, 9 – 11 March.

Hudec M., Minarikova, E., Schwarz, D., Fivaz, J. (2022). Estimating linguistic summaries on the unit interval data. *IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, Padua, 18.- 23. July, 2022.

Schwarz D., Emmenegger B., Fivaz J., Hudec M., Portmann E. (2024) Effects of fuzzy voting on citizen participation: Empirical evidence from Switzerland. Tenth International Conference on eDemocracy & eGovernment (ICEDEG 2024), Lucerne, Switzerland, 24 - 26 June 2024. Accepted.

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Conclusion

As the Basel project has shown, some groups – particularly the often undecided and rare participants – feel more attracted to the flexible (fuzzy) voting.

However, it poses a number of challenges: the concrete application, usability for ordinary citizens, the comprehensibility of the calculation, the acceptance of the results, the new governmental acts, etc.

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Thank you for your attention

contact: miroslav.hudec@vsb.cz