

# Democracy for an interplanetary civilization

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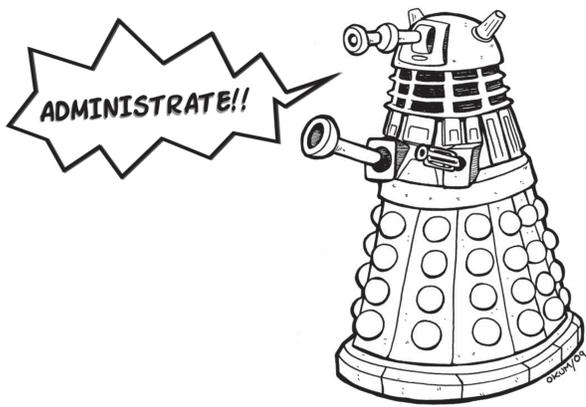
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## Abstract

How can a trillion human beings live together and make decisions on a galactic scale?

Giving all control to A.I. is a possibility, but we would have to be careful to end up in the **Culture** rather than in **I Have No Mouth, and I Must Scream**. Trusting a dictator or a small oligarchic group of humans with durable and complete power seems unwise, so our only shot might be to aim for a system that gives power to the people.

We shall expose three constraints that any political system should have, to show that at this scale, a single tool – randomness – could achieve those properties, before looking at the latest developments in probabilistic democracy.



## 1. The Three Constraints

When designing political and voting systems, we must satisfy three major constraints:

1. Security
2. Representativity
3. Efficiency

**Security** means that the system should accurately count the votes of the citizens, and prevent fraud, corruption, and coercion.

**Representativity** is simple in principle: decisions should be taken according to the will of the people, or in keeping with their interests. There are two possibilities:

- Representative democracies can have a parliament that's small enough to fit in a room and debate, but its representativity will go down and the logistical costs will go up as the civilization increases in population and size.
- Direct democracies can be made to work on a large scale, and don't have professional politicians whose interests diverge from the general population.

**Efficiency**, however, cannot be achieved if every citizen votes on all legal affairs, as we need time and expertise to make an informed decision (or to read this poster). But what if each law was voted upon by a representative group of people instead of the whole population? This way, you could have different subsets focusing on different aspects of the law, in parallel, so that every law would be voted upon by people who have given it their undivided attention for an extended time.

The first step in building such a system is to prove that such a group can have the same legitimacy as the whole population.

## 2. Quantity vs Quality

In 1936 in the USA, a massive poll (2.4 million out of 40 million voters) predicted that Alfred Landon would win the presidential election against Franklin D. Roosevelt with 57% of the vote. Instead, Roosevelt won in a landslide with 62% support.

The source of the errors was bias among the people who answered the poll: the sample wasn't representative at all. Even though the quota method has improved accuracy, polls still have problems because nearly no one answers them.

So how do we get a sample that behaves like the general population?

Let's define a group as representative according to a characteristic if the difference between the proportion of the people who have it in the sample and of those who have it in the general population is less than 0.5%. This *characteristic* is abstract, and could be "is a woman", "is anarchist", or even "listens to klezmer".

What if we randomly selected one million people uniformly among the general population? As it happens, this sample will be representative thanks to the following theorem, that remains true no matter the total population:

### Theorem

Given 5 000 different characteristics, the probability that a sample of 1 000 000 persons would not be representative according to at least one characteristic is less than 1 in a quintillion (1 in  $10^{18}$ ).

To put it in more intuitive terms, we could have taken a sample every second since the Big Bang and would still have a negligible chance of having a sample that wasn't representative.

The 0.5% margin could be made even lower, but this isn't necessary, as we are already close to the current best available precision.

## 3. Anonymity and Verifiability

No matter who gets to vote, any voting system should guarantee two properties: **secrecy** and **verifiability**.

When you use a secret ballot, no one can guess what you voted for (your vote is **secret**), but once you cast your vote you have no way of knowing whether it was counted correctly.

On the other hand, if you vote by raising your hand, you can **verify** the result yourself, but your vote is not **secret** and you can be coerced into voting for someone.

Only a decade ago, cryptographers showed that both properties are achievable at the same time with a very simple voting scheme. Designed for a choice between two candidates, it can also be extended for more.

1. Each voter gets three ballots, each with a unique secret number on it.
2. Voters cast all three ballots, but must use two of those to vote once for each candidate, with the remaining vote going to their first choice.
3. After voting, voters get a copy of one of their ballots at random.
4. The list of all the cast ballots is made public.
5. By subtracting the number of voters from the total of each candidate, to compensate the fact that everyone voted for them at least once, we get the result of the vote.

Let's show that this method is **secret** and **verifiable**:

- You can't prove who you voted for, because your copy shows the other candidate with probability at least  $\frac{1}{3}$ .
- You can **verify** the result because any tampering with your ballots is noticeable with probability  $\frac{1}{3}$  thanks to your copy. You can also check that no one added ballots by comparing the number of ballots with the number of voters.

In this system, fraud can be detected with probability exponential with the number of ballots changed or removed.

## 4. Corruption and Coercion

For the vote to have legitimacy, the sample has to be provably fair, with every citizen having the same chance of being selected. One possibility is a public lottery, but that raises new problems: having a reduced set of voters gives them more power, and when their identities are known, paying or forcing them to vote one way becomes very profitable.

This is why Random Sample Voting (RSV) was developed.

This protocol offers the following:

- A voting system that is simple, verifiable and secret, and can be used either online or offline.
- A sampling system that is provably fair, and that keeps the list of voters secret until after the vote.

Using game theory, it can even make it impossible to sell your ballots. Thus, RSV resists fraud, hacking, coercion and corruption; but is that enough?

## 5. Keeping the People Engaged

Even with provably secure and fair sampling and voting, restricting the vote to a tiny fragment of the population is dangerous. People already feel disconnected from the political life, and we should make sure that they are kept interested and satisfied.

This is where the Public Opinion Platform (POP) comes in. POP is an independent initiative that mixes party and platform, to allow people to contribute directly by giving their opinions on all political decisions in real time. This is the other half of the system: all the interested citizens can contribute, but only a representative sample can vote.

From RSV and POP, we can build many political systems with the following properties:

- Decisions taken are representative of what the general population would choose if given time to think about it thoroughly.
- High citizen participation is maintained.
- The infrastructure is cheap, despite having simple and provably secure voting.
- Everyone has an equal access to the system, with or without Internet.

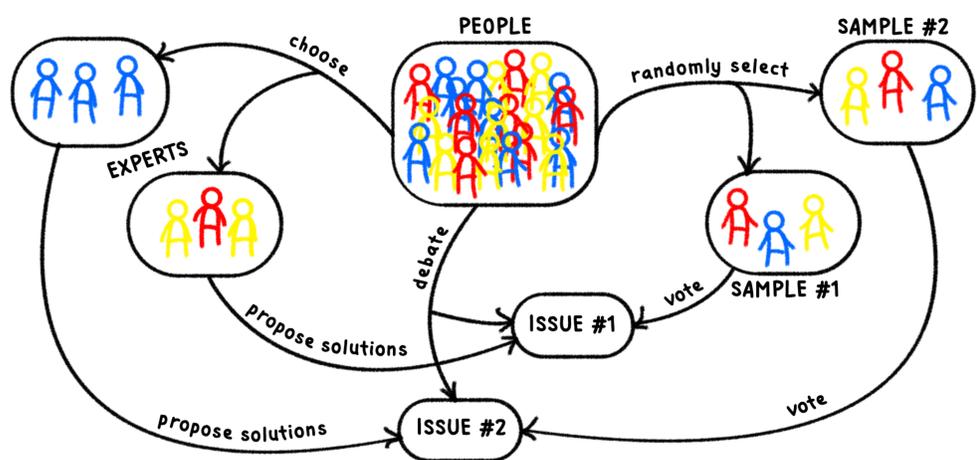
## 6. What's Next?

By design, POP is ready to hack democracy without changing the constitutions, by having elected members who then vote according to the will of the people on the platform. It evolves as it grows by steadily transferring power to the general population through sampling, to make sure it always represents the will of the people. Using those, we can progressively regain control of our political institutions, but there is still much work to be done, and your help is welcome.

To learn more about our projects, check out:

[www.rsvoting.org](http://www.rsvoting.org)

[www.POPlatform.org](http://www.POPlatform.org)



## References

- N.K. Blanchard. "Building trust for sample voting", TeSS 2017
- N.K. Blanchard. "Vote par sondage uniforme incorruptible", ALGOTEL 2016
- N.K. Blanchard. *La Démocratie Hasardeuse*. Book, to be published
- D. Chaum, RSV team. *RSV White Paper*, RSV website ([www.rsvoting.org](http://www.rsvoting.org))
- D.C. Parkes, P. Tylkin, L. Xia. "Thwarting Vote Buying Through Decoy Ballots", IJCAI 2017
- R. Rivest. *The ThreeBallot Voting System*

