

# Vote buying revisited

Hugo Jonker

SaToSS group, University of Luxembourg  
FM group, Eindhoven University of Technology  
(joint work with Wolter Pieters)

## Voting

● purpose

● requirements

## Anonymity

## Vote buying

## Buying

## Voters

## Conclusions

- establish consensus within a group
- incentive to direct consensus  $\implies$  attacks
- centuries-long refinement of attacks and countermeasures
- e-voting: years-long reinvention of the wheel

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## Election requirements:

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## Election requirements:

- Democracy
  - ◆ Only eligible voters
  - ◆ 1V1V

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## Election requirements:

- Democracy
  - ◆ Only eligible voters
  - ◆ 1V1V
- Accuracy
  - ◆ Result depends on *all* cast votes...
  - ◆ ... and *only* on the cast votes...
  - ◆ ... as they were cast.

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- Verifiability
  - ◆ individual
  - ◆ universal

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- Fairness
- Anonymity (Receipt-freeness)



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● intuition

● in voting

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Expressed using anonymity groups.

$$AG(subject) \subseteq AnonymitySet$$

(note: *subject* wants anonymity)

Two dimensions of anonymity:

- Indistinguishability
- Uncertainty

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Two dimensions of anonymity:

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- Indistinguishability ( $AG(Pieter) \subseteq Profs$ )
- Uncertainty

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Expressed using anonymity groups.

$$AG(subject) \subseteq AnonymitySet$$

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Two dimensions of anonymity:

- Indistinguishability ( $AG(Pieter) \subseteq Profs$ )
- Uncertainty ( $AG(salary(Pieter)) \subseteq [3k, 25k]$ )

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What is anonymity in voting?

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What is anonymity in voting?

- unknown who cast a vote?

$$AG(v) \subseteq \mathcal{V}$$

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What is anonymity in voting?

- unknown who cast a vote?

$$AG(v) \subseteq \mathcal{V}$$

- unknown for whom the cast vote was?

$$AG(choice(v)) \subseteq \mathcal{C}$$

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What is anonymity in voting?

- unknown who cast a vote?

$$AG(v) \subseteq \mathcal{V}$$

- unknown for whom the cast vote was?

$$AG(choice(v)) \subseteq \mathcal{C}$$

- the link between these two unknown?

$$AG(ballot(v)) \subseteq \mathcal{B}$$

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What is anonymity in voting?

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Extra twist: vote buying!



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Because it interferes with the intent of voting:

*A collective expression of will as inferred from a number of votes.*

– dictionary.com

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■ Does vote buying always interfere?

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- Does vote buying always interfere?
- What about election promises?

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Because it interferes with the intent of voting:

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- Does vote buying always interfere?
- What about election promises?
- ...
  
- Where is the boundary between the two?

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Examine issue from influencer's point of view.

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Examine issue from influencer's point of view.

Two ways to influence voters:

1. enticement  
reward, seduce
2. coercion  
threaten

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- **acceptability**
- motivating examples

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Illustrations of acceptable and unacceptable conduct:

**acceptable enticement** promising to lower taxes

**unacceptable enticement** paying a voter to vote for you

**acceptable coercion** claiming the others to be far worse

**unacceptable coercion** threats of physical violence



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Examples of incentives for rewards:

- *handout*  
give each voter 100,- and mention candidacy

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- *theme park*  
district with most votes gets a theme park

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Examples of incentives for rewards:

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- *theme park*  
district with most votes gets a theme park
- *tax rebate*  
upon election, everyone gets 100,- tax refund

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Examples of incentives for rewards:

- *handout*  
give each voter 100,- and mention candidacy
- *theme park*  
district with most votes gets a theme park
- *tax rebate*  
upon election, everyone gets 100,- tax refund
- *mensa*  
upon election, disabled child prodigies get 100,-

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Classification approach: adopt attack trees (Schneider).

Example:

- open safe
  - ◆ get combination
    - guess
    - from keyholder
  - ◆ break open
    - by force
    - lockpick

## Derived dimensions:

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Derived dimensions:

- group size (!)

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Derived dimensions:

- group size (!)
- reward dependent on election



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Derived dimensions:

- group size (!)
- reward dependent on election
- rewarding conditions (cast vote, election win, unconditional, other)

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Derived dimensions:

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- ... and others

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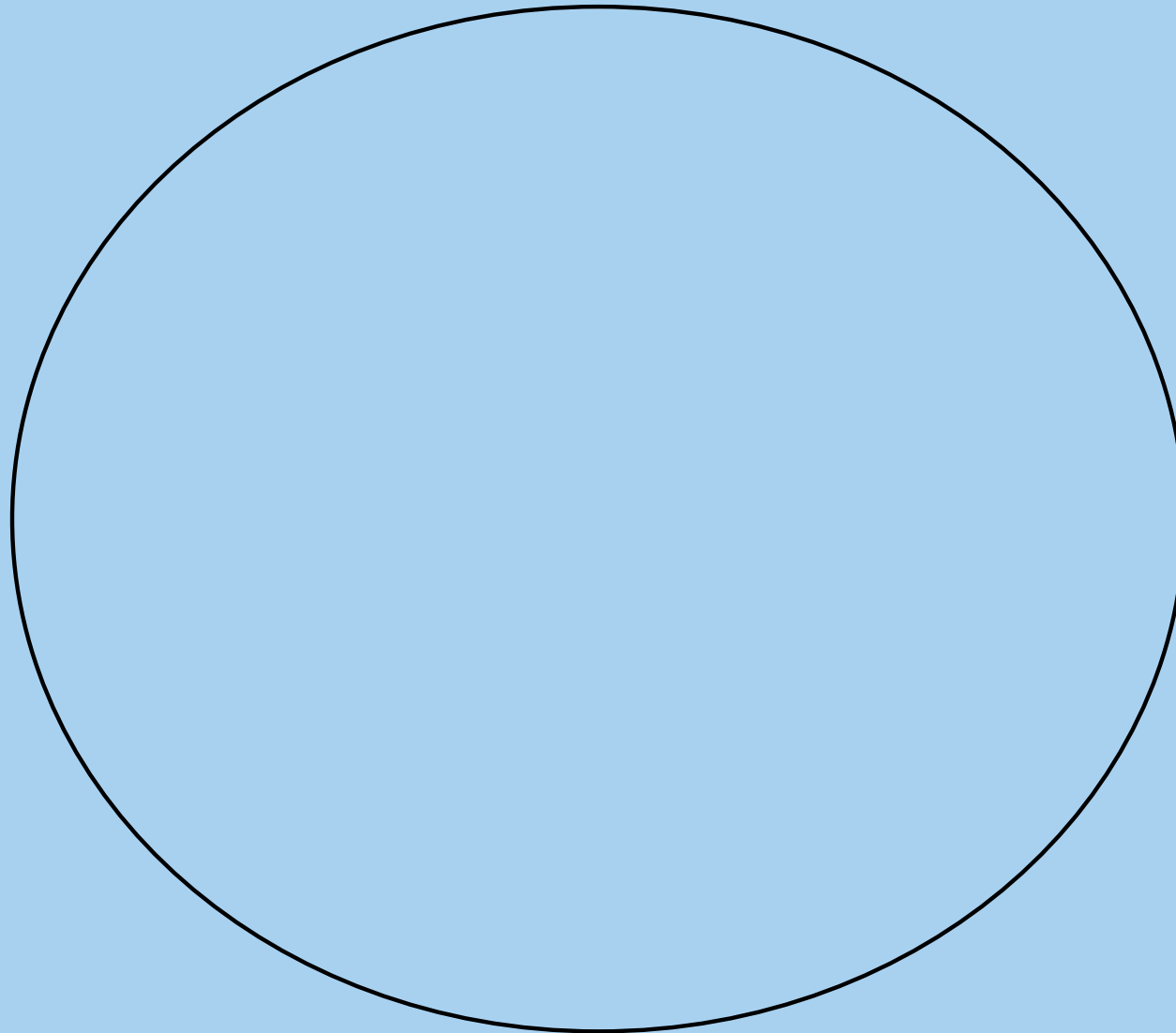
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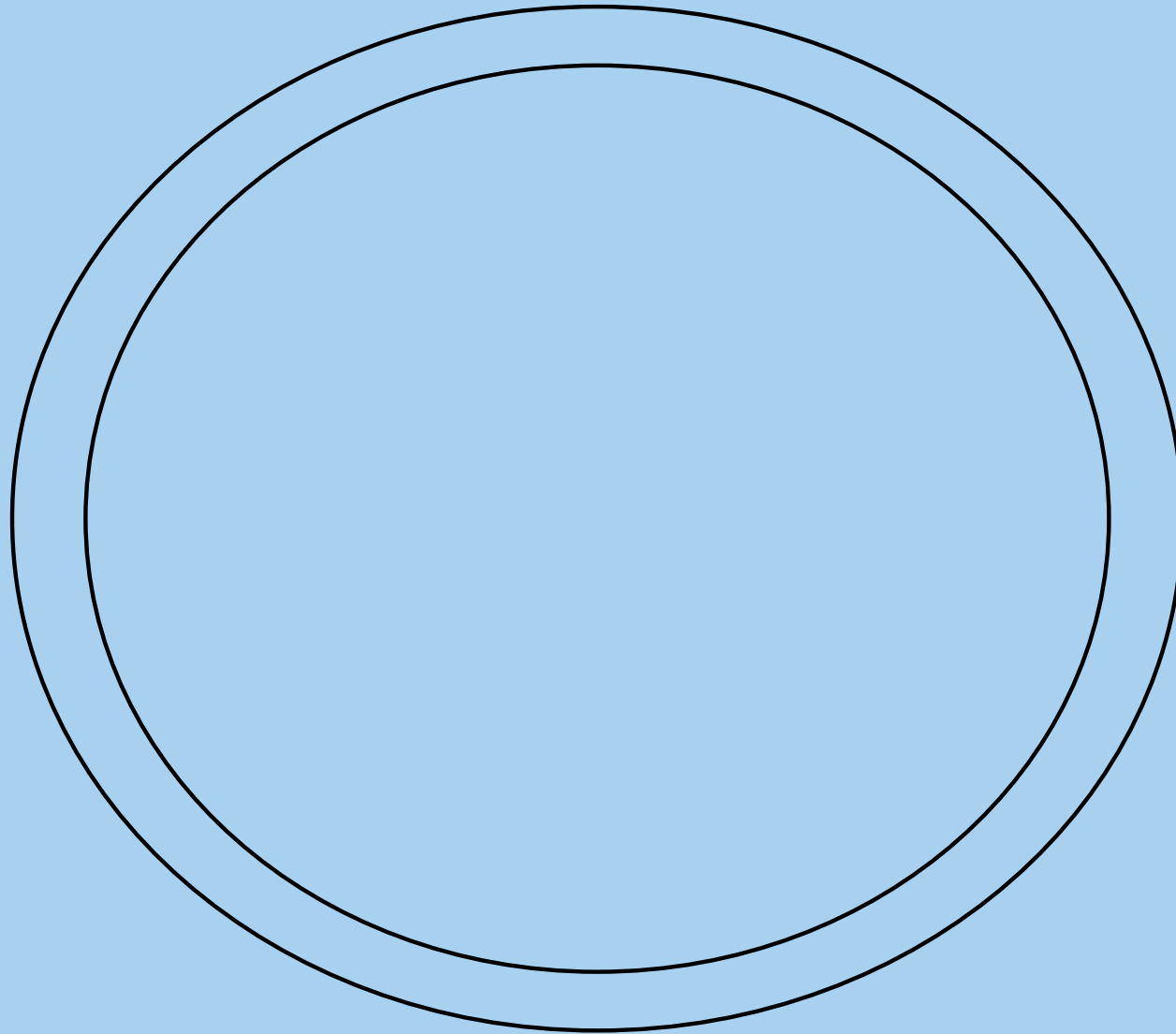
Attack tree not ideally suited to determine dimensions.

- Voting
- Anonymity
- Vote buying
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- Voters
  - classification
  - characteristics
  - objective analysis
- Conclusions



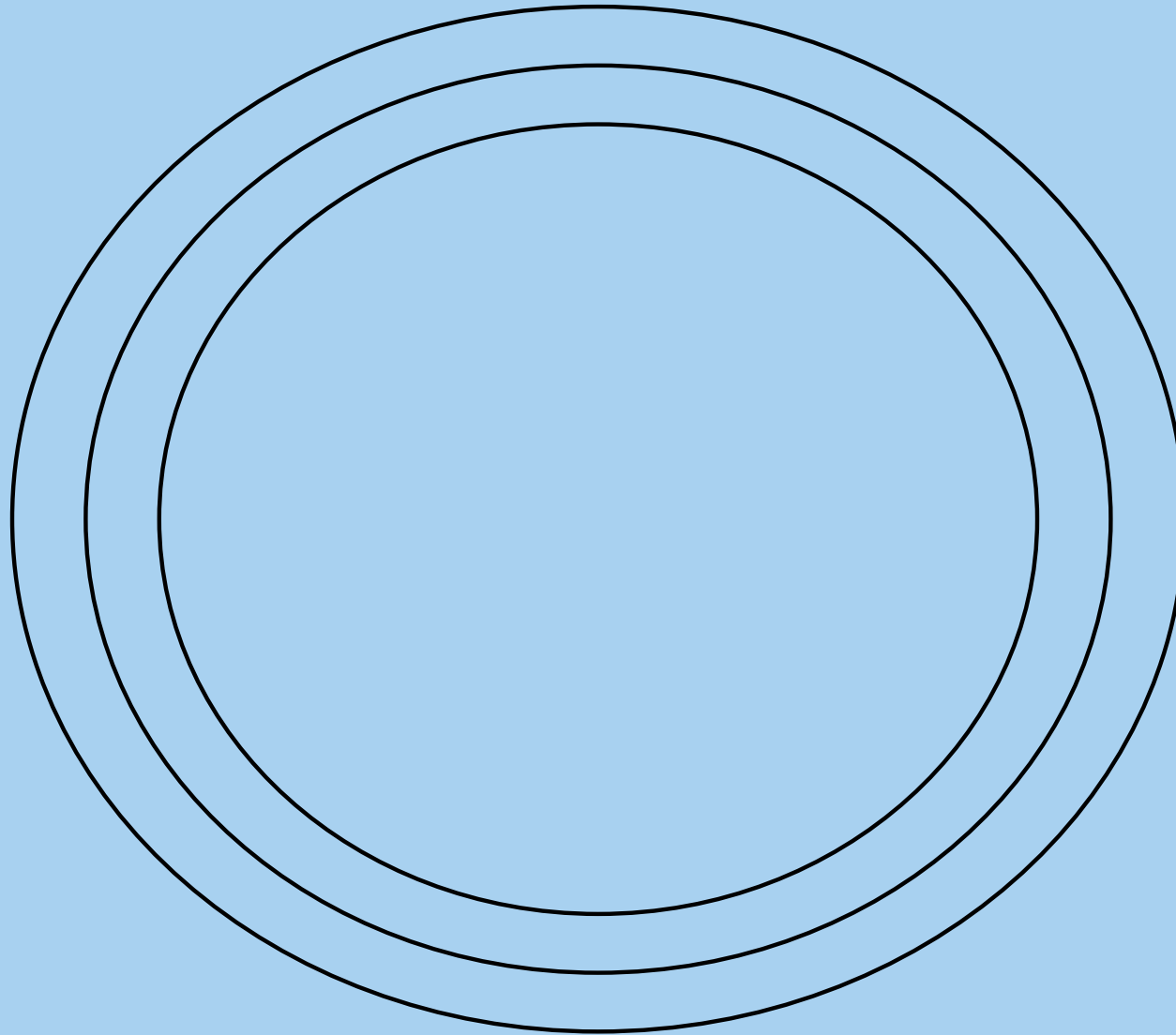
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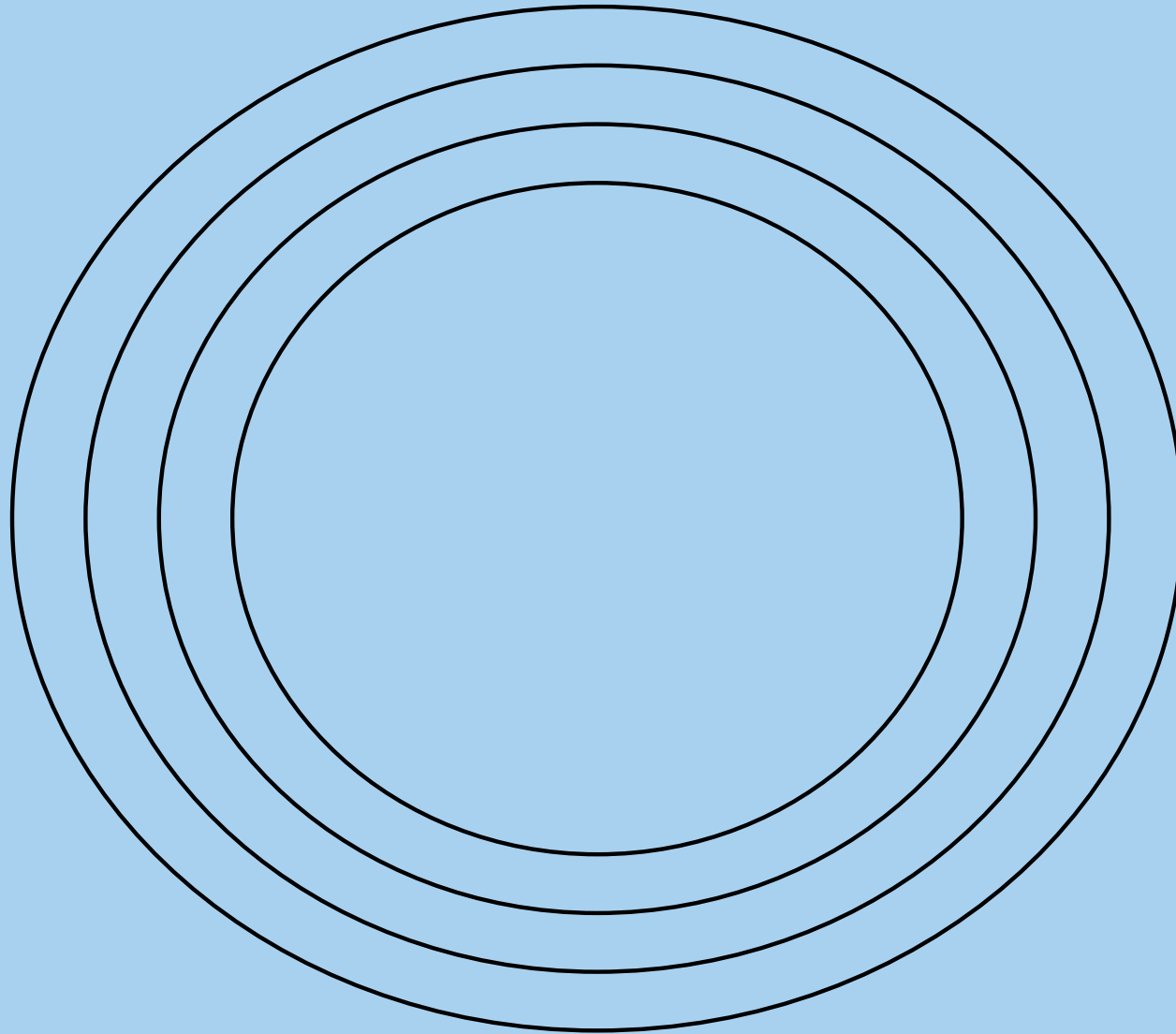
Eligible Voters

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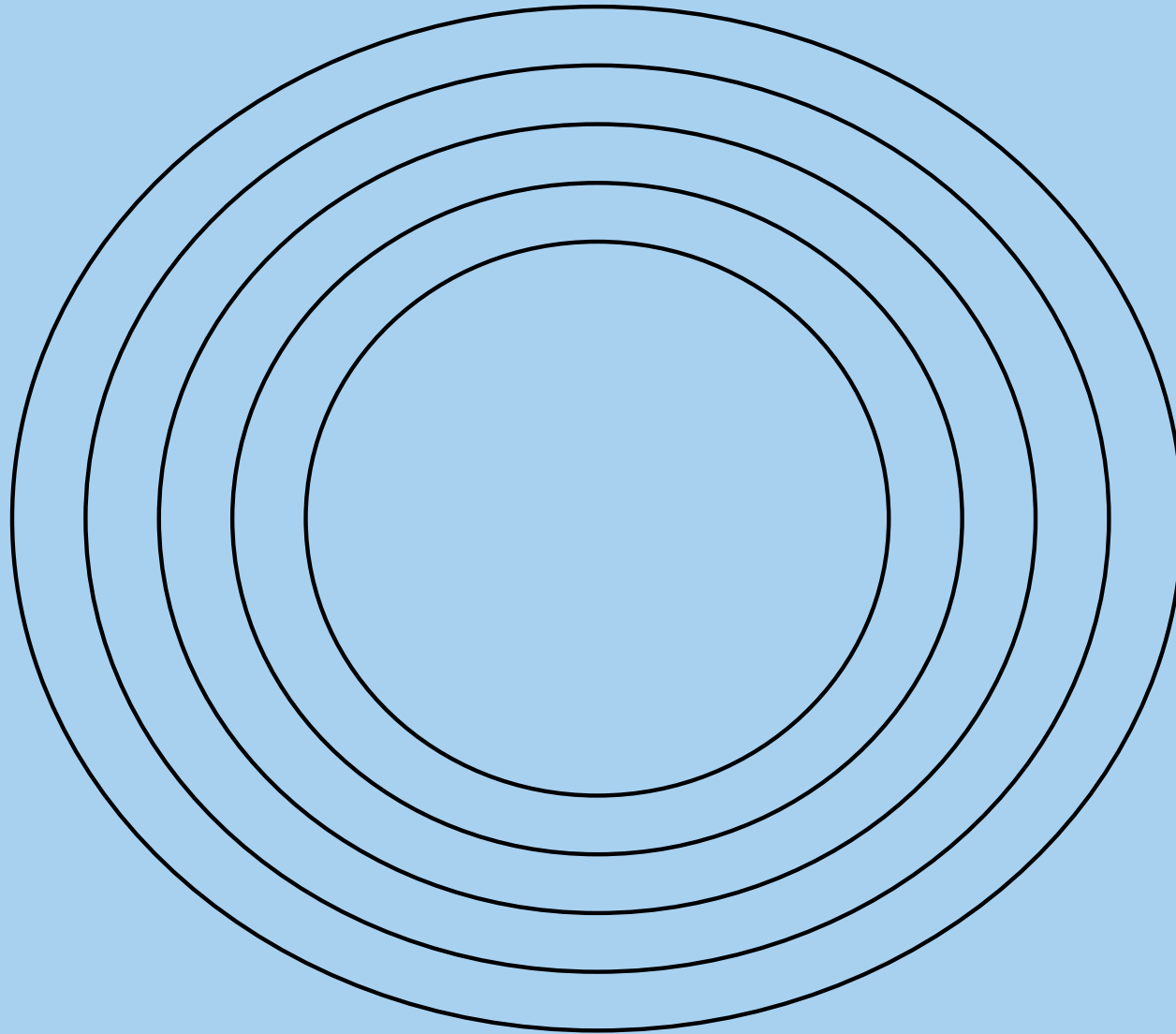
Registered Voters

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Voters casting votes

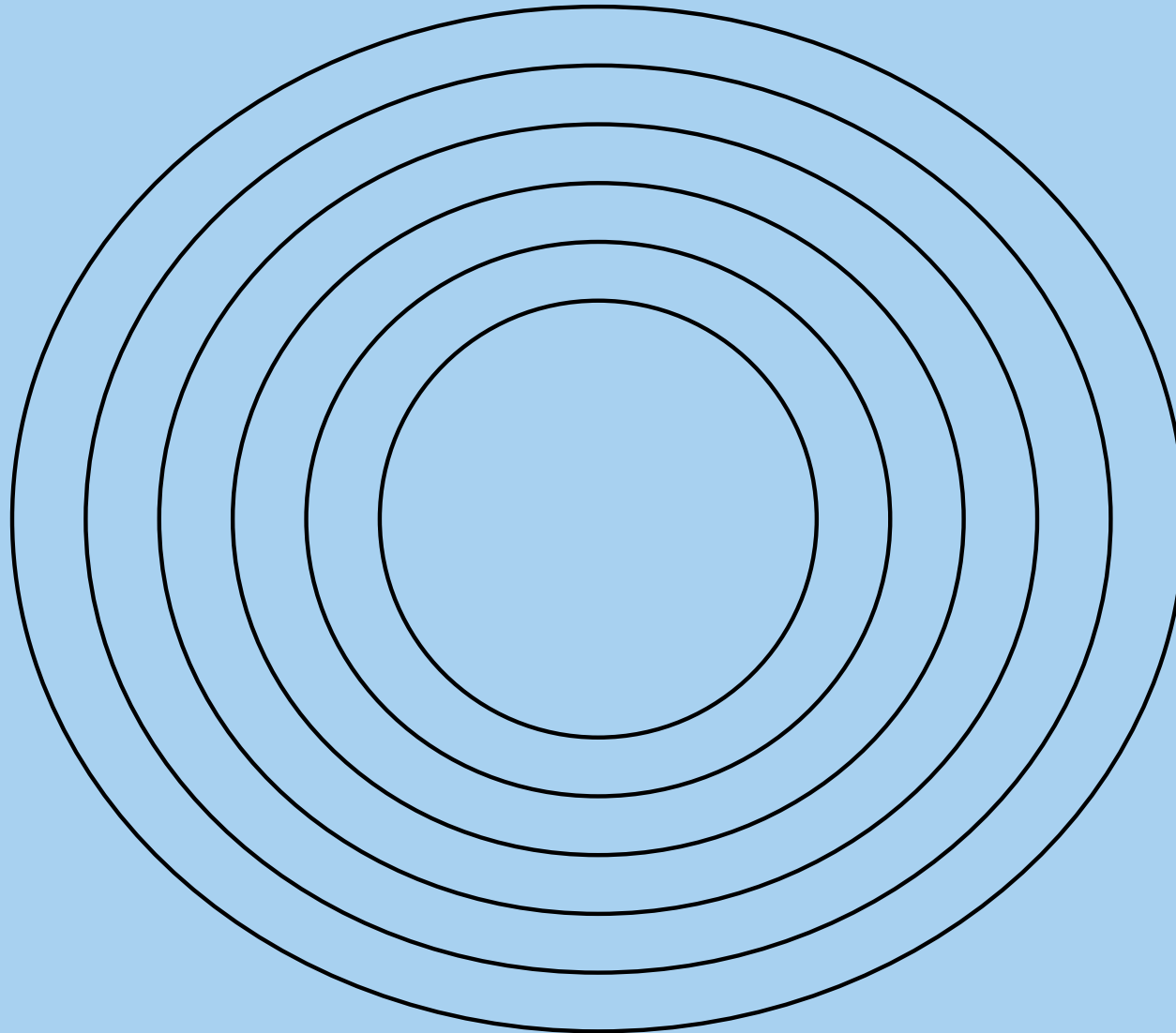
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Voters casting valid votes



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Voters casting compliant, valid votes

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Voter characteristics w.r.t vote buying:

- accepts reward

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Voter characteristics w.r.t vote buying:

- accepts reward
- initial preference

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Voter characteristics w.r.t vote buying:

- accepts reward
- initial preference
- aware of attempt

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Voter characteristics w.r.t vote buying:

- accepts reward
- initial preference
- aware of attempt
- targetted

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Voter characteristics w.r.t vote buying:

- accepts reward
- initial preference
- aware of attempt
- targetted
- vote cast

Voting

Preliminary attack tree constructed (WIP).

Anonymity

Vote buying

Early indication:

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Generic effect of vote buying is already attainable by casting the vote(!)

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Vote buying. . .

- . . . depends on many different issues
- . . . can be hard to distinguish from election promises
- . . . can be targetted at influencing groups

In short: vote buying  $\neq$  money in exchange for proof of compliance



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## Thank you for your attention

[hugo.jonker@uni.lu](mailto:hugo.jonker@uni.lu), [h.l.jonker@tue.nl](mailto:h.l.jonker@tue.nl)