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Extending Handivote to Handle Digital Economic Decisions

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Visions : e-Democracy

The internet and communications revolution has brought us lots of new ways of doing things

- e-Commerce.
- Democratic access to information.
- Democratic expression of opinion via blogging.
- New collaborative work practices in the open-source community
- Undermining of monopoly via P2P networks

Stefan Meretz and the Keimform theorists argue that these are the germ of a whole new social order. But as yet it has had little impact on the political system.

Can we use modern communications technology to democratise complex social decisions like, for instance, the Budget?

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Socio-technical Protocols are needed

Existing applications required appropriate protocols and practices

What protocols would be required for participatory budgeting?

1) **We present a basic e-voting protocol suitable for yes/no plebiscites**

2) **Show how to extend this protocol to multidimensional votes on taxation and expenditure.**

Social Aspects

- **Voting Systems must be UNDERSTANDABLE**
  - Paper voting has this quality
- **People need to ACCEPT the system**
  - Paper systems are widely used and generally acceptable
- **Systems need to be SIMPLE**
  - Scottish Voting system of 2007 was NOT
- **People need to be convinced of the SECURITY of the system**
- **People need to TRUST the system**
- **It must be easily accessible – no income barriers to use.**

Acceptability of MultiDimensional Voting

- **TRUST**
  - Anonymity is required
  - Auditability facilitated to allow verification
- **EASE of USE**
  - Casting the vote should be very simple
- **USEFULNESS**
  - Mobile Phone Voting lowers the bar to participation
  - No Geographical or Time constraints
- **COMPATIBLITY**
  - Depends on familiarity with the device. *Mobile phone saturation in the UK is over 100%*

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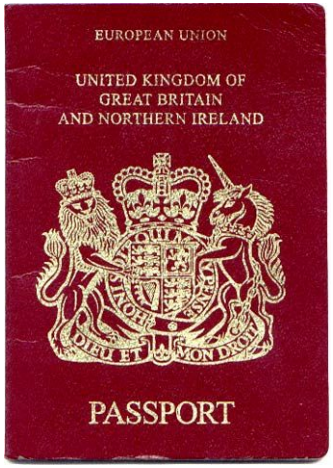
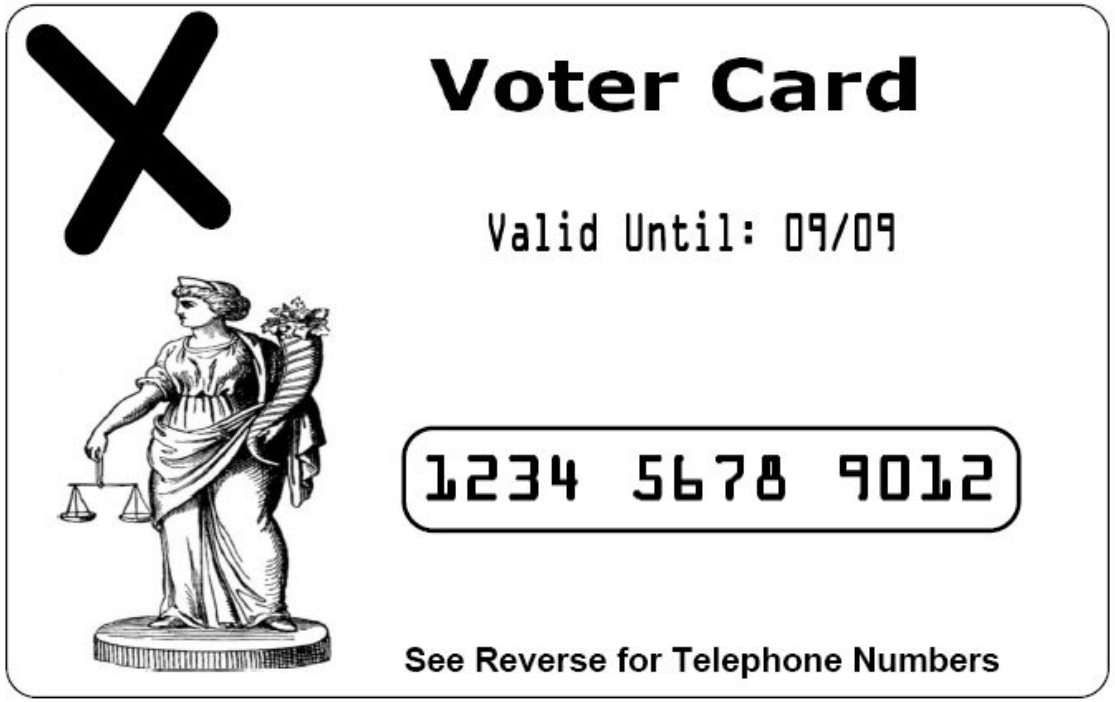
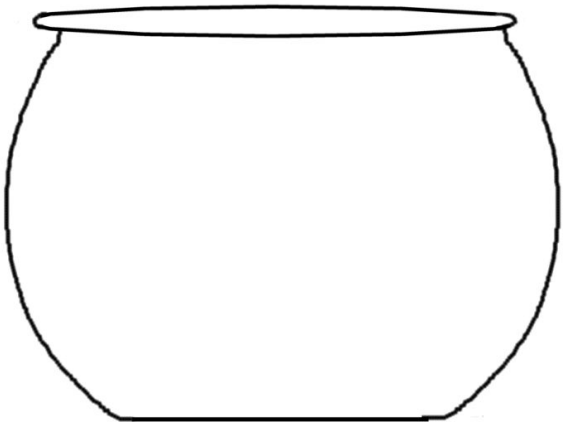
Handivote

Registration

- At registration you put hand in jar and pull out an envelope with a voters card.
- Nobody but you knows which card you chose





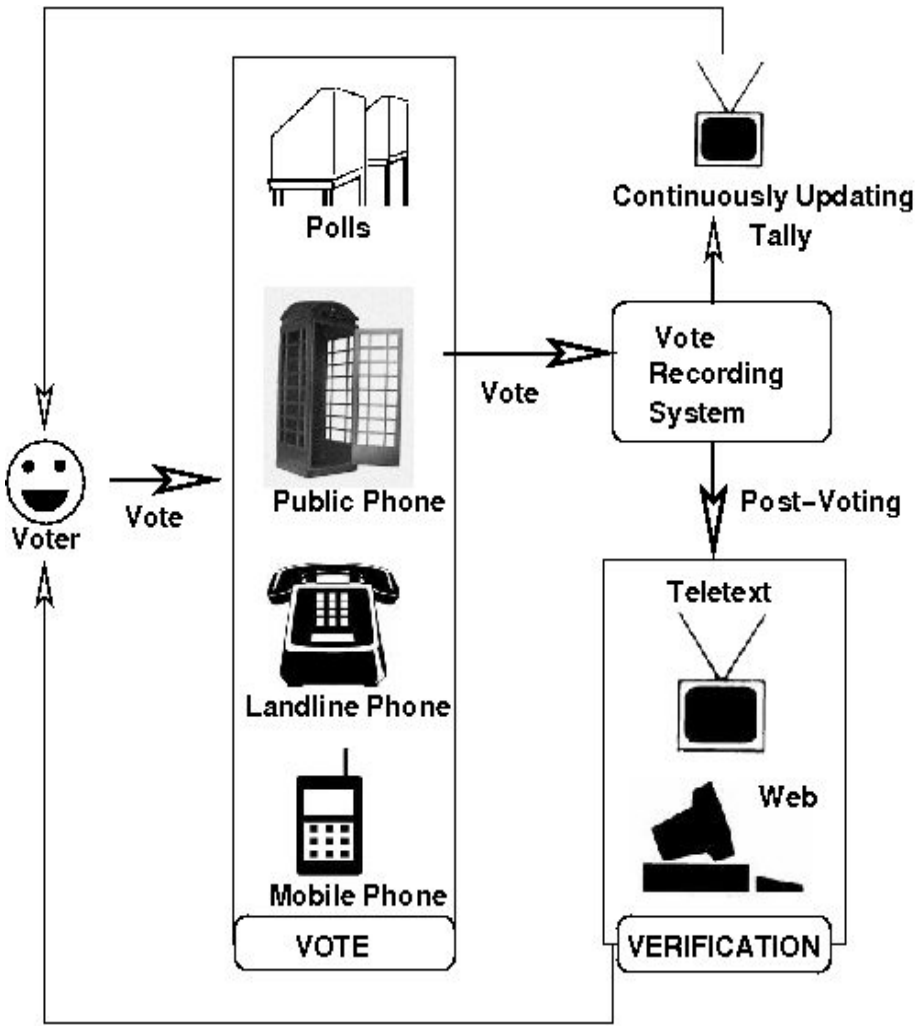


Info analysis

- Of the order of 30 million voters in UK
- Thus we need 8 digit voter number
- With a 4 digit PIN these amount to 12 digits to type in
- **2309 5528 9942**

Voter number pin

Many Ways to Vote



- **Dial or text yes number or no number**
- **Then send voter id in the body of message or, on a landline, key it in.**
- **Free landlines provided at polling places for those with no telephone.**

During Voting

Real Time Count of Votes Cast

TV Camera

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Verification

- At end of vote, complete list of yes and no votes with the PINs elided is published on the internet and the newspapers.
- Each person can check that their vote is correctly recorded,
- The total yes and no votes can be checked independently
- The published voter numbers can not be used by 3rd parties who do not have the PIN.

- You know that your vote was recorded ok
- But nobody else knows your voter's number
- So nobody else knows how you voted.

Extending to Multidimensional Choices

Politics involves more than yes no decisions

- We have decisions that involve ranges – how much should health expenditure change by
- We have interdependencies between decisions – spending more requires raising more revenue, cutting taxes implies cutting expenditure

How can a fundamentally discrete voting process be extended to handle this?

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Ranges and consensus

- **Suppose you give three choices: raise base rate of income tax by 5%, reduce by 5% or abstain if you are happy with the current rate.**
- **Suppose 40% abstain, 40% say cut by 5% and 20% say raise by 5%**

choice	shift	Voter %	weighted vote
abstain	0.00%	40.00%	0.00%
up	5.00%	20.00%	1.00%
down	-5.00%	40.00%	-2.00%
Consensus as weighted sum			**-1.00%**

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Multiple dimensions-> vectors

- **You can potentially vote on several taxes going up or down: VAT, Base rate Income tax, High rate income tax,...**
- **In addition there are multiple headings of expenditure that could go up or down : Health, Education, Transport, Defence,...**
- **If people can cast a vote on each that concerns them you end up with a Vector Vote of tax and expenditure changes eg: [0,-1,+5,+3,+1,-1,-2]**
- **This stage exists even for the Chancellor now, he is chosing a point in a vector space even if he does not think of it that way.**

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Functional dependencies

- **But would not that just result in taxes being voted down and expenditure up?**
- **Well there would have to be a pre-given constraint in terms of the incremental budget deficit.**
- **If there is then we can resolve the vector vote to a feasible vote.**
- **In what follows we assume a balanced budget constraint, but one could assume a fixed budget deficit constraint without altering the argument.**

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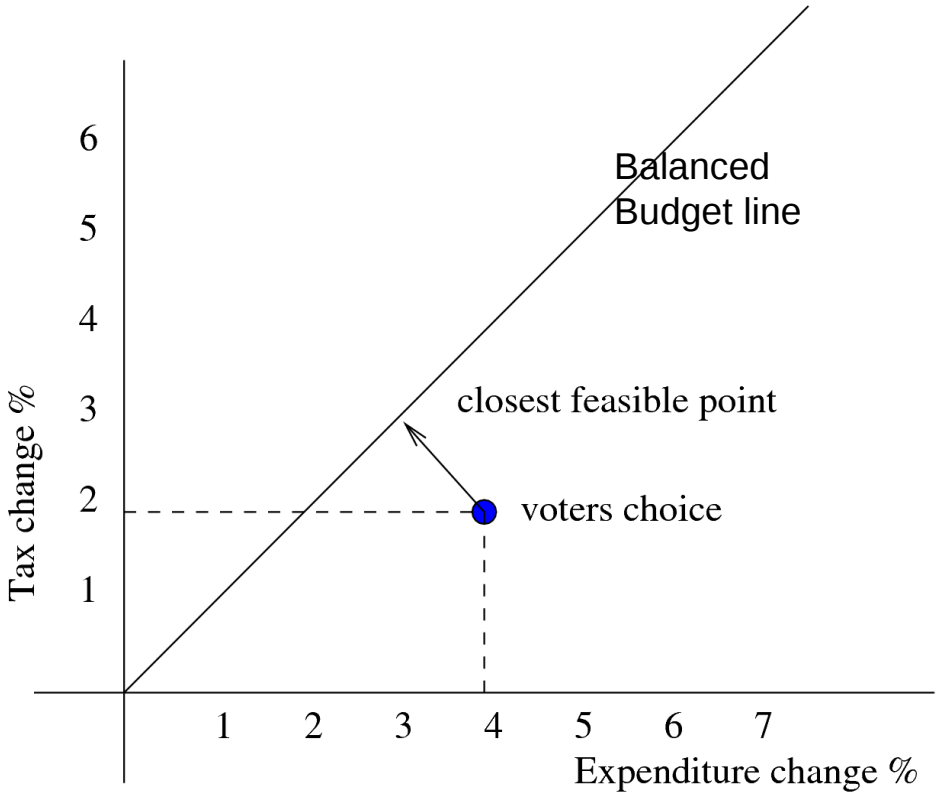
General case

- If we have an n dimensional vote vector, this implies an n dimensional decision space.
- A budget deficit constraint, along with the current shares of each tax and expenditure heading in total revenue defines an $(n-1)$ dimensional hyper-plane in the decision space : the feasible set.
- There are well established algorithms to find the closest point on an $(n-1)$ dimensional hyperplane to an n dimensional point.

Simple example



- **Suppose voters want 4% increase in expenditure but only 2% increase in tax.**
- **Move from the vote position to the closest point on the balanced budget line.**
- **In this case 3% increase in both tax and expenditure**

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Comprehensibility

- **The vector maths used in the algorithm could not be understood by the general public.**
- **But simple diagrams like the previous slide explain it clearly.**
- **Even more simple explanation :**
  - 4% spending vote, 2% tax vote
  - Split the difference means
    - 3% increase in each

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Comparison with now

Alistair Darling must perform a similar algorithm by trial and error.

Lord Home admitted that as chancellor he balanced the budget using piles of matchsticks.

The results can hardly be more rational nor more representative of voter opinion than what we propose.


Questions?