Statement Voting & Liquid Democracy

Hong-sheng Zhou
Virginia Commonwealth University

Joint with

Bingsheng Zhang (Lancaster University)
E-voting encompasses a broad range of voting systems that apply electronic elements in one or more steps of the electoral process.

Two main categories:
- On-site e-voting systems
- Remote e-voting systems
conventional voting — roles
conventional voting — roles

- Bulletin Board (broadcast)
- Voters
- Trustees
conventional voting

tally: process the voting ballots

Voters

vote for candidate #1
vote for candidate #2

Trustees

e.g. Helios
practical
statement voting: a new concept

Voters

P1 votes for candidate #1
vote for candidate #2

P2 follows P1

P3 follows P1 if P1 votes; otherwise votes for candidate #2
statement voting — without privacy

tally circuit: process the voting statements

P1 votes for candidate #1

P2 follows P1

P3 follows P1 if P1 votes; otherwise votes for candidate #2
statement voting — with privacy

tally circuit: process the voting statements

Threshold Fully Homomorphic Encryption

Voters

P1 votes for candidate #1
P2 follows P1
P3 follows P1 if P1 votes; otherwise votes for candidate #2

Trustees
statement voting — with privacy

tally circuit: process the voting statements

Threshold Fully Homomorphic Encryption
Zero-Knowledge Proof

P1 votes for candidate #1
P2 follows P1

P3 follows P1 if P1 votes; otherwise votes for candidate #2
statement voting — with privacy

Tally circuit: process the voting statements

Threshold Fully Homomorphic Encryption

Zero-Knowledge Proof

Voters

P1 votes for candidate #1
P2 follows P1

P3 follows P1 if P1 votes; otherwise votes for candidate #2

Trustees

Helios+ not practical
statement voting — with privacy

tally circuit: process the voting statements

- Threshold Encryption
- efficient Zero-Knowledge Proof
- Mix-net

Voters

P1 votes for candidate #1

P2 follows P1

P3 follows P1 if P1 votes; otherwise votes for candidate #2

Trustees

full version practical
the full scheme
voting functionality

tally circuit: process the voting statements

support voting statements

Voters

P1 votes for candidate #1
P2 follows P1
P3 follows P1 if P1 votes; otherwise votes for candidate #2

Trustees
liquid democracy

- Liquid democracy (a.k.a. delegative democracy) [Ford 2002] is a hybrid of direct democracy and representative democracy, where the voters can either vote directly on issues, or they can delegate their votes to representatives who vote on their behalf.
statement voting: a new concept

Voters

P1 votes for candidate #1

P2 follows P1

P3 follows P1 if P1 votes; otherwise votes for candidate #2

vote for candidate #1

vote for candidate #2

Voters

Take home message
Reference:
Long version at https://eprint.iacr.org/2017/616