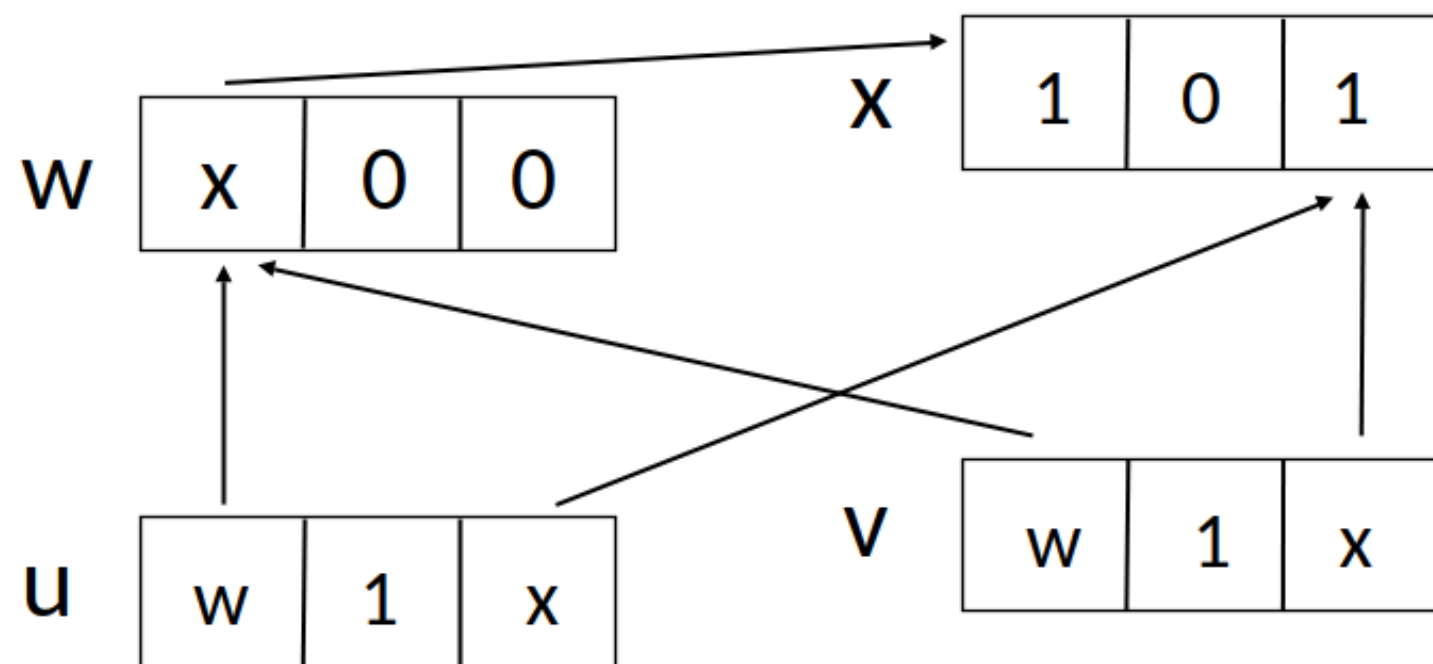


Preserving Consistency for Liquid Knapsack Voting

(extended abstract)

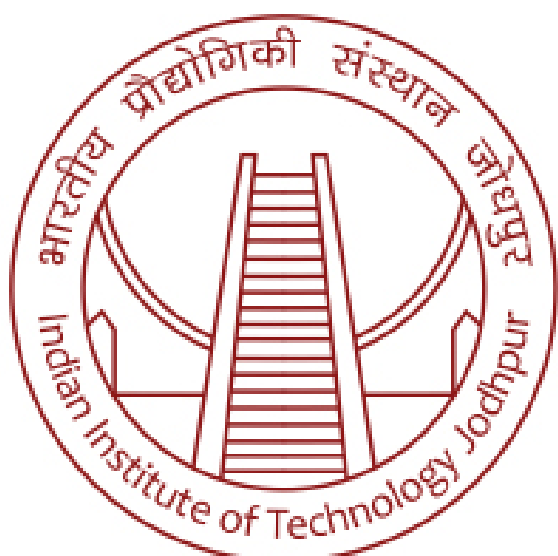


AAMAS 2021

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Participatory Budgeting

decide the use of public funds in a municipality by direct democracy

voters submit their preference on projects of their choice and the goal is to choose a subset of project that maximises the voter's satisfaction and the total cost is within the budget

Knapsack Voting

voter submits a subset of project whose total cost is within the budget



Liquid Democracy

voters delegate decision to other voters

Problem:

it may lead to inconsistent ballot after resolving delegations

Consistent Knapsack Voting

Question: Can we update at most k delegations to disapproval or approval so that the resultant instance, after following all transitive delegations, would result in all voters respecting the constraint?

NP-hard even if:

- each voter delegates to only one other voter,
- the number of projects is 4 and the budget is 1,
- the maximum number of delegations in a vote is 3,
- the maximum number of approvals in a vote is 1,
- the costs of all projects are equal,
- the maximum length of a delegation chain is 2,
- the maximum in-degree in the delegation graph is 3.

Solvable in **polynomial** time:

- when every voter delegates at most one project,
- if all delegation chains are of length at most one.

Parameterized Complexity of Consistent Knapsack Voting

- **W[2]-hard** with respect to k even if each voter can delegate to only one other voter.
- **FPT** with respect to the number of voters.
- **FPT** with respect to C , where C is the number of delegation components.

Integer Linear Programming formulation

- Liquid Knapsack Voting can be formulated as an integer program with C binary variables, where C is the number of delegation components.