

## Part II: Synthesis of Concepts from the Complexity Sciences

# Collective Decision Making

Marko Rodriguez of Los Alamos National Laboratory presented an overview of recent trends and findings in the field of Collective Decision Making Systems and Prediction Markets



I'm going to talk about Dynamically Distributed Democracy, which is an accurate way of determining the values of a collective. It is an example of collective decision making, using computers to support the process.

Collective decision making with computer support began in the 1980s with Group Decision Support Systems. They wanted to improve on the limitations of the hierarchy to remedy deficiencies in face to face meetings. In 2000 Murray Turoff developed the concept of Social Decision Support Systems. His idea was to develop a system so that instead of voting every 4 years, how could everyone in a society or a community could constantly participate?

Another concept is "collaborative discourse," which is for people to see the flow of argumentation. The intent was to come to consensus prior to voting.

My work covers all these, under the broad title of Collective Decision Making Systems. How can we use computers to help humans make decisions?

This presentation complements my paper, "A Survey of Web-based Collective Decision Making Systems," co-authored with Jennifer H. Watkins.

A key concept is how we rank the value of artifacts. Google uses a human-driven ranking algorithm. Web pages are linked. which forms a network.

Google's algorithm figures out the centrality of nodes in a network. Nodes that are more central are ranked higher, which is based on human value judgments. Most of the work of Google is done by people who build the network by linking web pages together. For every web page there is a ranking value, which is determined by making the links.

How do you categorize? How do you structure an environment so that humans will get you to solutions? Sometimes you want collaboration, sometimes competition, sometimes categorization. Flickr and Delicious are called "folksonomies," where people label things any way they want. Patterns of labeling emerge because people tend to converge on labeling conventions.

There are some key concepts pertaining to collaboration. We all know the Wiki. Open source software is a huge movement. Anyone can help develop software. If the code is good it gets put into the next release. The software to support open source is good at distributing tasks to people who are good at various functions.

The last page of the paper, shown below, shows a taxonomy of these systems. On the left it shows "problem space." You use different tools to address different kinds of problems.

	Document Ranking	Folksonomy	Recommender	Vote	Wiki	Open Source	Prediction Market
<b>Problem Space</b>							
Decision Type	information retrieval	information retrieval	information retrieval	governance	content creation	content creation	prediction
Decision Principle	centrality	frequency	similarity	frequency	consensus	consensus	trade
Goal	quality retrieval	quality retrieval	quality retrieval	satisfaction	document utility	code utility	predictive accuracy
Accuracy Metric	precision recall	precision recall	precision recall	fairness	usability	usability	forecast standard error
<b>Implementation</b>							
Solution Space	number of artifacts	number of artifacts	number of artifacts	ballot	creative output	creative output	disjoint + exhaustive
Interface Complexity	very restrictive	not restrictive	not restrictive	not restrictive	restrictive	very restrictive	restrictive
Skill Set	web-page design	basic skills	basic skills	basic skills	wikitext syntax	programming	market trading
Contributor/User	both	both	contributors	contributors	both	both	both
<b>Individual Features</b>							
Motivation	connectedness	organization	personalized advice	cooperative	critical	critical	competitive
Expertise	unnecessary	unnecessary	unnecessary	unnecessary	necessary	necessary	necessary
Membership	co-opted	self-selecting	auto/self-selecting	self-selecting	self-selecting	self-selecting	self-selecting
<b>Collective Features</b>							
Size	large	large	large	variable	variable	variable	variable
Diversity	coverage	coverage	coverage	none	improvement	improvement	coverage + improvement
Interaction	none	imitative	none	strategic	stimeric	stimeric	strategic

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# Dynamically Distributed Democracy & Prediction Markets

Marko also discussed key aspects of Dynamically Distributed Democracy and Prediction Markets.



### Dynamically Distributed Democracy

The question I'm interested in concerning Dynamically Distributed Democracy is, "How you do get a decision in a large group?" What would happen if you wanted everyone to have a say in the system and participate in the evolution of the system? Everyone in the country can't be there at all times to participate.

You can have asynchronous voting - a time window. In our current system, if you ignore your opportunity to vote you lose your chance to vote.

The concept of Social Compression relies on some people being able to represent others. Any subset of the whole can be a model of the whole.

In a direct democracy, if not everyone is participating then there is error in the vote because not everyone's views are represented in the final result. So we're looking for a solution to this.

In a trust-based social network where the network propagates vote power, if an individual is not present they can allow others to use their voting power. The premise is that socially close individuals will have similar values.

In Dynamically Distributed Democracy, because of the weighting mechanism there is no error.

In direct democracy, if 100% of the population participates there is no error. But as participation wanes, there is an increase in the error.

With dynamic distribution, if 50% or 20% participate you still get an accurate reflection of what everyone perceives. You don't need everyone to participate, you need to weight the population effectively.

Open governance is starting to emerge in society. If you want anyone to be able to produce policy, you need infrastructure. Wikis are good infrastructure for this. Implementation of policy is based on open source principles. This is a techno-dream system of how a government could be run. "Smartocracy" is a

### Prediction Markets

Information Markets are a general category, and prediction markets are an example in this category. The idea of the prediction market is to aggregate individual knowledge into global knowledge.

The premise is that as complexity increases in a system, a single individual cannot understand that entire system. The idea of the prediction market is to aggregate individual knowledge into global knowledge. Our brains are engineered for pattern matching, but when we lack language we cannot match. So we rely on aggregating the knowledge of many to match the complexity of the system with an understanding of the system.

In a prediction market you don't vote on your preference, you vote on what you think will happen. If you have knowledge you can make money with that knowledge.

Robin Hansen of George Mason University developed a prediction market system in response to 9/11. He suggested that people participate to help make predictions about future terrorist acts. It's a very accurate mechanism, but it was shut down due to social concerns.

For a prediction market to work, you specify a date and a specific action that will or won't happen: Specific outcomes are specified at specific dates.

You also need:

- a diversified population.
- a collective of self-interested traders.
- a market and a payout mechanism.

Yahoo uses an internal prediction market to consider at new products.

For more information see: <http://cdms.lanl.gov>