The New Fields of Public Policy Engineering, Political Engineering, Computational Public Policy, and Computational Politics

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Abstract: *This research paper defines four new fields called public policy engineering, computational public policy, political engineering, and computational politics. Public policy engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in public policy. Computational public policy is the application of computer science or mathematics to solving problems in public policy. Political engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in politics. Computational politics is the application of computer science or mathematics to solving problems in politics. Public policy engineering and computational public policy include, but are not limited to, principles and methods for public policy formulation, decision making, analysis, modeling, optimization, forecasting, and simulation. Political engineering and computational politics include, but are not limited to, principles and methods for political decision making, analysis, modeling, optimization, forecasting, simulation, and expression. The definition of these four new fields will greatly increase the pace of research and development in these important fields.*

Keywords: public policy, politics, engineering, computer science, mathematics, natural science

1 Introduction

In this research paper, the author, Ashu M. G. Solo, defines four new closely related fields that he is initiating called *public policy engineering*, *computational public policy*, *political engineering*, and *computational politics*. Basic and advanced methods in engineering, computer science, mathematics, or natural science can be used for public policy formulation, decision making, analysis, modeling, optimization, forecasting, and simulation as well as for political decision making, analysis, modeling, optimization, forecasting, simulation, and expression. This will lead to greatly improved public policy and political decision making.

For example, legislators usually determine spending priorities and budget allocations based on passions of the moment, special interest lobbying, parochial interests, ignorant public opinion, or their own ideological biases rather than on a rigorous mathematical and computational analysis of how spending priorities and budget allocations can be made for the greatest public benefit. Politicians often determine how to spend limited campaign funds on advertising in certain geographic areas based on their best guesses rather than on a rigorous mathematical and computational analysis of how funds should be allocated for the greatest benefit to their campaigns. There needs to be more technocracy in democracy.

2 Public Policy Engineering and Computational Public Policy

Public policy engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in public policy. Computational public policy is the application of computer science or mathematics to solving problems in public policy. Therefore, computational public policy is a subset of public policy engineering. Public policy engineering and computational public policy include, but are not limited to, principles and methods for public policy formulation, public policy decision making, public policy analysis, public policy modeling, public policy optimization, public policy forecasting, and public policy simulation. Public policy engineering and computational public policy are more technically, computationally, mathematically, and scientifically rigorous approaches to the field of public policy.

The term *e-government* [1, 2] refers to the use of information and communication technologies in government operations, access to government data, interactions between government agencies, interactions between government and citizens, and interactions between government and external organizations. Therefore, an e-government activity only constitutes public policy engineering when principles or methods in engineering, computer science, mathematics, or natural science are used in public policy formulation, decision making, analysis, modeling, optimization, forecasting, or simulation. An e-government activity only

constitutes computational public policy when principles or methods in computer science or mathematics are used in public policy formulation, decision making, analysis, modeling, optimization, forecasting, or simulation.

The formulation of criminal sentencing policy does not constitute public policy engineering or computational public policy. However, the formulation of criminal sentencing policy involving the use of computational intelligence methods for determination of criminal sentences would constitute public policy engineering and computational public policy.

3 Political Engineering and Computational Politics

The term *political engineering* [3] has been previously used to refer to designing political institutions. This is a poor usage of the term and an abuse of the word *engineering.*

Engineering consists of theoretical engineering and applied engineering. Theoretical engineering is the creative development of mathematics, natural science, technical principles, or technical methods for usage in the development, analysis, characterization, modeling, control, automation, optimization, forecasting, simulation, or visualization of devices, algorithms, components, systems, machines, apparatuses, structures, processes, operations, or materials. Applied engineering is the creative application of mathematics, natural science, technical principles, or technical methods for the development, analysis, characterization, modeling, control, automation, optimization, forecasting, simulation, or visualization of devices, algorithms, components, systems, machines, apparatuses, structures, processes, operations, or materials. These definitions of engineering, theoretical engineering, and applied engineering are by the author of this research paper.

As it has been previously used, the term *political engineering* does not require the creative application or development of mathematics, natural science, technical principles, or technical methods for the development, analysis, characterization, modeling, control, automation, optimization, forecasting, simulation, or visualization of devices, algorithms, components, systems, machines, apparatuses, structures, processes, operations, or materials. Therefore, the author of this research paper is giving a new and more appropriate definition to the term *political engineering.* Just like many terms in the dictionary have multiple meanings, the term *political engineering* can have multiple meanings.

As defined by the author of this research paper, political engineering is the application of engineering, computer science, mathematics, or natural science to solving problems in politics. Computational politics is the application of computer science or mathematics to solving problems in politics. Therefore, computational politics is a subset of political engineering. Political engineering and computational politics include, but are not limited to, principles and methods for political decision making, political analysis, political modeling, political optimization, political forecasting, political simulation, and political expression. Political engineering and computational politics are more technically, computationally, mathematically, and scientifically rigorous approaches to the field of political science.

The term *e-politics* [4] refers to politics and the Internet. Some aspects of the field of e-politics, such as e-voting, are part of political engineering. An e-politics activity only constitutes political engineering when principles or methods in engineering, computer science, mathematics, or natural science are used in political decision making, analysis, modeling, optimization, forecasting, simulation, or expression. An e-politics activity only constitutes computational politics when principles or methods in computer science or mathematics are used in political decision making, analysis, modeling, optimization, forecasting, simulation, or expression.

Political expression on a blog doesn't constitute political engineering or computational politics. However, political expression involving the use of software methods for automatically generating political blog entries based on the latest polling data or government data would constitute political engineering and computational politics.

4 Scope of Public Policy Engineering and Computational Public Policy Research and Development

4.1 Scope of Public Policy Engineering Research and Development

The scope of research and development in the field of public policy engineering includes, but is not limited to, the following:

Public Policy Formulation, Decision Making, Analysis, Modeling, Optimization, Forecasting, and Simulation

- public policy decision making under uncertainty
- new technologies in public policy
- application of engineering to public policy
- application of computer science to public policy
- application of mathematics to public policy
- application of natural science to public policy
- application of operations research to public policy
- application of optimization methods to public policy
- application of computational intelligence methods to public policy
- uncertainty management in public policy decision making

- application of machine learning methods to public policy
- application of pattern recognition to public policy
- application of data mining to public policy
- application of decision theory to public policy
- application of game theory to public policy
- data fusion for public policy decision making
- public policy forecasting
- public policy modeling
- public policy simulation
- public policy visualization
- public policy software tools
- case studies

4.2 Scope of Computational Public Policy Research and Development

Computational public policy focuses on the application of computer science or mathematics to the research and development issues listed in section 4.1.

5 Scope of Political Engineering Research and Development

5.1 Scope of Political Engineering Research and Development

The scope of research and development in the field of political engineering includes, but is not limited to, the following:

Political Decision Making, Analysis, Modeling, Optimization, Forecasting, Simulation, and Expression

- political decision making under uncertainty
- new technologies in politics
- application of engineering to politics
- application of computer science to politics
- application of mathematics to politics
- application of natural science to politics
- application of operations research to politics
- application of optimization methods to politics
- application of computational intelligence methods to politics
- uncertainty management in political decision making
- application of machine learning methods to politics
- application of pattern recognition to politics
- application of data mining to politics
- application of decision theory to politics
- application of game theory to politics
- data fusion for political decision making
- political forecasting
- political modeling
- political simulation
- political visualization
- political software tools
- political campaign software tools
- case studies

5.2 Scope of Computational Politics Research and Development

Computational politics focuses on the application of computer science or mathematics to the research and development issues listed in section 5.1.

6 Conclusion

The definition of the new fields of public policy engineering, computational public policy, political engineering, and computational politics will greatly increase the pace of research and development in these extremely important fields. These fields are critical for the future success of politics and public policy.

In the future, after more research and development is done in these fields, graduate or undergraduate university degrees can even be offered in political and public policy engineering as well as computational politics and public policy. Political and public policy engineering should be combined into one curriculum for engineering students because politics and public policy necessarily go together. Similarly, computational politics and public policy should be combined into one curriculum for science students because politics and public policy necessarily go together.

A political and public policy engineering curriculum could include courses in mathematics, physics, chemistry, biology, software engineering, electronics, intelligent systems, machine learning, pattern recognition, data mining, communication networks, power systems, operations research, domestic policy, foreign policy, history, law, economics, finance, accounting, organization theory and design, technical writing, etc. A computational politics and public policy curriculum could include courses in mathematics, software design, artificial intelligence, machine learning, pattern recognition, data mining, communication networks, operations research, domestic policy, foreign policy, history, law, economics, finance, accounting, organization theory and design, technical writing, etc.

Graduates of these programs would be skilled in doing research and development to apply methods in engineering, computer science, mathematics, or natural science to solving problems in public policy and politics as government executives, government legislators, government bureaucrats, government staff, and political campaign staff. Political and public policy engineers as well as computational political and public policy scientists would also be able to work in closely related areas like e-government, e-politics, and e-voting.

7 References

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