KFAB to KOFGAB?? Theory updated 09-19-2023

This is a brief outline of my theory developed over the last 10 years. Developments of the theory have been presented at the Society of Industrial and Applied Mathematics (SIAM) conferences and talks, Caltech Numerical Relativity Group, Southern California Applied Mathematics Symposium (SOCAMS), Pomona Amateur Astronomers-Harvey Mudd College, and regular colloquiums with colleagues. The papers are available on Academia.edu and Google Scholar, and popular articles are on my Linked In page and websites.

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Outline: in chronological order from July 2013 to 2025

I proved Galerkin finite element/finite volume FEM-FVM methods to solve the Helmholtz equation for electro-magnetic cloaking, EM black holes, fluids, etc. Tools included Transformation optics- applying general relativity gravitational to electromagnetic fields, and Isogeometrics- using FEM in CAD as B-Splines or knots. Ran cloaking and plasma simulations.

The applications to Metamaterials including cloaking, EM black holes, solar energy, plasma-fusion, space propulsion systems, and antenna. Arizona business developed metamaterial cloaking, plasma, antenna. Started propulsion, grants, etc.

A String in electromagnetic field is Born-Dirac-Infeld (DBI) Action. The DBI is simpler way to detect strings in nature, easier than gravity. The DBI is used to detect cosmic strings, stretched strings in space, with LIGO. I correlated the DBI action to Galerkin FEM-FVM EM black holes.

I modified the Feynman Kac PDE quantum field-path formula for probabilistic strings, then proved a correlation to the Koopman Von Neumann operator theory (KOT). The KOT is ergodic (complex system), Feynman Kac revised with classical Newtonian and Black-Shoals in economics, finance.

The KOT applied to data science/machine learning-AI converts nonlinear data to linear but with infinite dimensions. Dynamic Mode Decomposition (DMD) reduces dimensions by Principal Component Analysis (PCA) and Fourier series.

The DMD is a Galerkin method that couples cloaking/EM black hole/DBI to Koopman-Feynman Kac. The theorem and proof for this is in process.

The Koopman hidden (compacted) dimensions are analogous to holographic AdS/CFT where gravity is (d+1) with quantum (d) field projected onto it. The AdS/CFT is currently the most promising method to prove M-theory(string theory consolidation) and uniting all forces including gravity.

In machine learning-AI the hidden dimensions are neural networks used to compute node decision trees. The Boltzmann machine is a Koopman neural network with probabilistic physics energy values as nodes. These energy values are holographic (AdS/CFT) and can be string nodes/knots.

A knot is a group of tangled strings. The same knot, scaled up or down, can be a Galerkin b-spline, black hole singularity, energy node, field turbulence, particle path, fluid dynamics vortex, tangled string/D-Brane(2d), quantum computer-AI qubit, cryptographic code, DNA helix, molecular compound, topological data shape, robotics path, stock market behavior, etc. Fractals are knots.

 The same knot can be mathematical/physical shape, data pattern, energy node, or path over time.

The torus is a powerful shape, one of the most powerful in nature. The simplest torus is a circle, which is a 0-knot. A torus in 3d is a doughnut with strings wound around it. The D-brane is a torus wrapped to form singularity-paper funnel. All of these are modified knots. Tori are used in fusion reactors to contain electro-magnetic field. Metamaterial tori create plasma and fusion propulsion systems.

Current research involves knot tori-metamaterials and theorem for knot Koopman-Galerkin method.

Therefore, the Koopman Feynman Kac AdS Boltzmann Galerkin theory (KOFGAB?) can perform experiments with torus/knot D-Branes, both analytically and data-AI driven. Applications include PDEs, fluid dynamics, metamaterial cloaking, plasma/fusion energy /propulsion, string/brane M-theory, quantum field theory, knot theory, complexity/chaos, quantum computing-AI/cryptography, neural networks-AI, robotics, economics/stocks, biology-genetics.

Parts of the theory, such as knots, can be carried over into art, philosophy, history, anthropology. Science fiction (or science future?) includes invisibility, time travel, teleportation, human-quantum AI, full fusion energy.