Knowledge Encapsulation Framework (KEF)

Pacific Northwest NATIONAL LABORATORY
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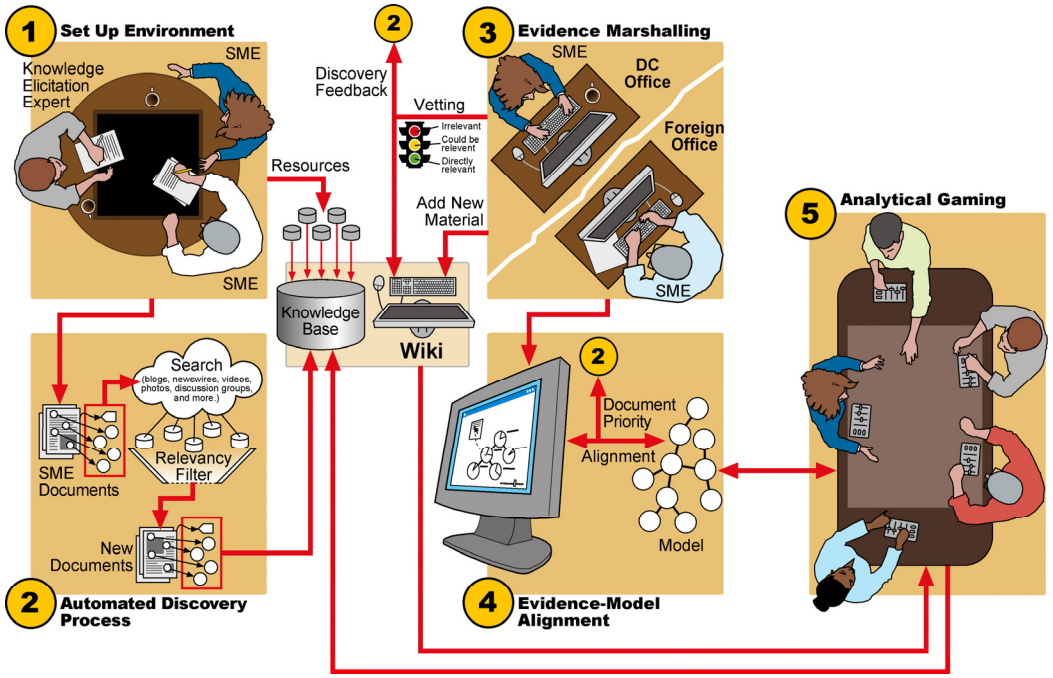

Technical Approach

- *Semantic Collaborative Environments*. The environment is based on open-source wiki software and extensions that enable interaction between users, their personal annotations and the semantic annotations produced by the NLP pipeline.
- *Natural Language Processing (NLP) Pipeline*. As documents come into the environment, a suite of annotators identify people, places and domain-specific terms as well as 'statistically interesting phrases' that occur within the document.
- *Machine Learning (ML) Techniques*. The environment uses ML to feed back user vetting decisions as well as characterize evidence-model alignments so that new incoming material can be prioritized (e.g.,"these documents contain the same concepts as those previously aligned with your model) and documents already within the wiki can be suggested as potentially relevant.

Challenges

Computational modeling is an intellectual endeavor requiring domain collaboration across a number of subject-matter experts (SMEs), models and programmers. This activity is rarely enabled through collaborative means, making the activity less efficient, more time consuming and therefore more expensive. Parameterization of model inputs is often left to single individuals and policy/decision makers are left out of the entirely, requiring a modeler to run models upon request.

Solution

We have developed a collaborative semantic wiki environment designed to exploit current resources and automatically find new, related information from social and traditional sources.

Technosocial Predictive Analytics Initiative

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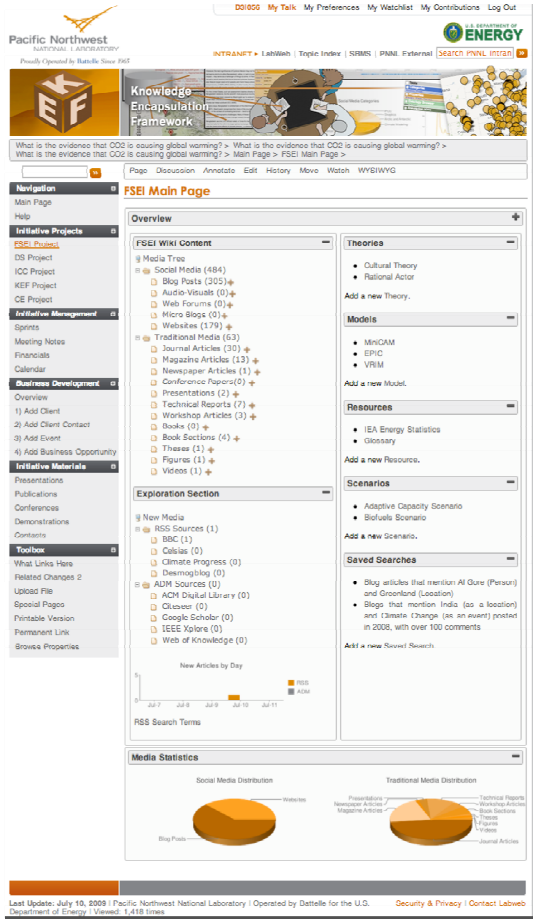
Objective

To provide a usable, effective collaborative environment for modelers to exploit the resources they have while providing a rich stream of potentially relevant content to review. Modelers should be able to import their model, align evidence, open up model input parameterization to multiple users and eventually export the model for execution within their chosen environment.



KEF Approach

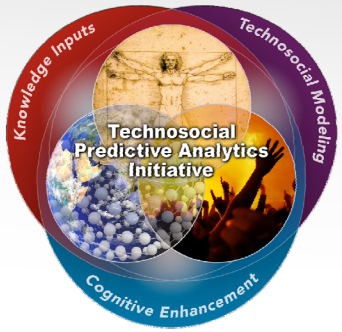
The Knowledge Encapsulation Framework (KEF) provides a flexible, extensive evidence marshalling environment. The environment allows users to store, share and annotate datasets and other information objects (e.g., documents, images, video) and provides the means to link these to model inputs. In addition, the framework is able to learn which information objects are of interest and mine online sources for new, related information – across both traditional and social media such as blogs, wikis and web forums. What remains is a flexible, effective workflow where SMEs can collaborate over a steady stream of incoming, domain-relevant material, linking evidence directly to model nodes. These models can then be exported for execution in their native modeling environment and exposed to policy/decision makers via analytical gaming.

Transformational Change

- An environment where modelers can teach the system the concepts required to drive their model and allow the system to prioritize incoming domain-relevant, semantically annotated material for review.
- An analytical framework that can utilize the power of multiple domain SME's (potentially geographically dispersed) all providing input to the evidence marshalling and parameterization phase.
- A backend that provides a flexible, extensible natural language processing pipeline, customizable for any modeling activity.

The Technosocial Predictive Analytics Initiative (TPAI) is taking the next steps to address complex, interwoven issues with highly integrated, innovative models to help analysts and policy makers identify and counter strategic surprise.

TPAI supports a multi-perspective approach to predictive analysis through integrated reasoning, drawing knowledge insights from both the natural and social sciences.



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