Wire It Right!
Electrical Inspector’s Software Tool
Usage/Design Scenario

High concept statement: The Wire-It-Right! electrical inspector’s software tool is intended to guide electricians and contractors in construction and remodeling wiring and their own inspection-type walkthroughs for fault-free inspections. It guides official electrical inspectors in inspection of same. The system contains the legal code for electrical wiring and additional notes to explain and interpret obscure language of the code. It uses filters to narrow inspection focus and facilitates real time documentation of inspection results and post-inspection report generation.

The typical usage situation would be a software tool running on a laptop at a construction site.

Two main user classes:
1. Official electrical inspectors working for the local government with jurisdiction over the building site use the tool to guide their inspections. During inspection they take notes on results of inspection and after inspection is over, they produce inspection report.
2. Electricians and contractors use the tool to guide electrical wiring work, and especially to serve as a reference resource when questions arise. As a bonus, contractors can use the tool to do their own quick walk-through (unofficial) inspection preceding an official inspection, to help be sure the official inspection will go smoothly.

Neither of these user classes can change the electrical code or the ‘built-in’ explanatory notes, but they can add more explanatory notes of their own.

Other user classes identified:
1. Database administrator, only one who can make changes to electrical code part of database (updated when the law for the code is changed).
2. Inspection tool developer, the only one except the database administrator who can change the explanatory notes and inspection questions.

Screen objects:
Electrical code – read-only text window. Contains the legal code used to guide electrical wiring
Example: the electrical code for outlets near areas that can get wet or near plumbing fixtures must use Ground Fault Interruption (GFI) outlets.

Explanatory notes – Editable text window. Since much of the code is written in obscure and ambiguous legalistic terminology, it needs explanation for electricians to be sure about its application. The software package comes with substantial content in this window, written by experts to help electricians and contractors understand, interpret, and apply the code. However, since the code can vary by location and can change with time, plus individual users will want to add their own notes, this field is editable for user customization. Once an inspector learns the rationale behind a portion of the code, the explanatory notes are not needed and this window can be dismissed to save screen real estate.

Example: A GFI outlet, which will open the circuit (remove voltage) if it senses any voltage on the ground wire or the slightest current flows to the ground. If, for example, a hair dryer plugged into a GFI outlet had an internal short so that voltage was present on any exposed metallic part where the
user can touch the hair dryer (e.g., the screws in the case), it would immediately open the circuit, protecting the user from electrical shock in case they touch the sink while holding the hair dryer.

**Inspection filter (using in an inspection)** – pull-down menu to select existing keywords to identify type of inspection situation
Example: An inspection instance could be for a large office building, a commercial establishment (e.g., a restaurant), or a private single-family home. Different parts of the code would be invoked for each of these types of inspection instances, so need to be selective by this filter.

**Inspection filter (entering new keywords)** – Database administrator-type person can also can add terms to this list, to identify new inspection situations. This person would have to also be able to go in an 'tag' the code and other parts with this keyword, so those parts would get selected when this term is in the filter.

**Inspection directions and questions** – Not editable?? Purpose is to guide inspector step-by-step with all the questions that will apply the code to the particular inspection instance.
**Example:** The Electrical inspector is guided to look at these places for GFI-type outlets:
- Bathroom – all outlets
- Kitchen – outlets near sinks
- Basement areas that could become wet
- Outdoor applications – decks, outdoor lighting, all external outlets on house

**Results entry** – initially blank editable window. This is where inspector will record problems found during inspection and other notes to the builder/contractor. Inspector might take quick and dirty notes here and then go back to the office to edit and refine the inspection report.

**Relationships** (from one point in inspection to other possibly-related points): If a flaw is discovered at one point, sometimes there is a need for pointers to see other parts of the code that might uncover related problems.
**Example:** If there is a problem with not having a GFI outlet where it is required, the inspector should also be especially attentive in looking for incorrect polarities in the wiring of all outlets around the house.

**System architecture need:** Common single version of code for all. One version of explanatory notes for each inspector. Separate version of results and report for each inspection.

**Official inspector usage scenario:**

**Task 1: Pre-inspection setup**
Vinny, an electrical building inspector for Montgomery County, VA, has arrived at 3333 Indian Valley Rd, where the Acme Fine Building Co. is building a nice, new contemporary single-family home with a great view for the Gregson family. The house is about two-thirds built and almost all of the electrical wiring is finished. Vinny takes out his laptop and launches Wire It Right!, the Electrical Inspector's Software Tool. Before starting the inspection, Vinny selects the tab labeled "Site ID Info" and gets a form in which he enters the up-front 'boiler-plate' information such as address of building, name of contractor, name of owner, date of inspection, estimated date of building completion, name of inspector, etc.
Task 2: Establish focusing information
Since Vinny has done several earlier inspections at this site, he is interested in some specific aspects of the wiring this time. So he selects the "Filters" tab and gets a form with several fields that have pull-down lists of existing keywords that can be used to focus an inspection instance. (For the tool developer user, there is also a button on this screen labeled "New keyword" for adding more keywords to this list, an activity that has to be linked to adding tags to the database items. But we digress.) Vinny sets some inspection filters to focus the inspection on the aspects of interest, including one that addresses the need for special GFI outlets in wet areas. He also sets the level of inspection to be a final detailed inspection of all outlets, lighting fixtures, etc. In one of his earlier visits he had used this feature to focus an initial inspection on general wiring layout, the breaker box installation, and other early aspects of the wiring.

Task 3: Inspection
As Vinny begins the inspection process, selects the "Inspection" tab and gets a screen that shows several text boxes. The first is a little reminder of what is being used for current focusing information and that confirms to him that he has the right settings. The other text-boxes show the code, explanatory notes, inspection questions, etc. for the "current node" of the database structure. The system starts at root node of hierarchical database structure and traverses the structure stopping only at nodes that "pass" through the filter and abstraction requirements in the focusing lens. Since Vinny has a filter set for outlets in wet areas, he sees nodes that have to do with outlets in wet areas, but not lots of other parts of the code that are not selected by the various keywords in his filter. At some point early on, Vinny sees the code, notes, and questions for the node in the database that addresses the use of GFI outlets in wet areas. Vinny walks through the house and looks in bathrooms and the basement and finds all GFI outlets. He has the same results for all the outdoor outlets. Next he looks in the garage and finds non-GFI outlets. He knows that outdoors and basements are considered potentially wet areas, but being somewhat new at the job, he is not sure whether garages are also. So he scrolls through the code, but it doesn’t say explicitly one way or the other. So he scrolls through the explanatory notes (the built-in notes) and finds a paragraph on garages. It says that garages are technically not included, but that the trend is to use GFI outlets, anyway, for added safety. He also sees a note added by his supervisor that says in Montgomery County the policy is to require GFI outlets in garages, too. So, at least in his jurisdiction, this is a violation. He clicks on the "Results notes" button and brings up a window for entering results notes and types a few notes in it, including the observation that it won't take the contractor much time or money to replace the outlets in the garage. This note is automatically associated with the current node in the database, so the corresponding code reference and explanatory notes are connected to his note. The inspection concludes without further incident.

Task 4: Report generation
When Vinny arrives back at the office, he decides to get out the inspection report while the facts are still fresh in his mind. So he opens the laptop and launches Wire It Right! and selects the "Report" tab. He is now able to browse through all inspection results notes and cut and paste and edit them into an inspection report window. He can then print the report for mailing to the contractor and he can send an electronic copy of the report to his supervisor for archiving, making it available for future review.