PROCESS SIMULATION USING CAD ANALYSIS

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ABSTRACT

In the world of Modeling and Simulation it is common to model physical movement of objects throughout a defined area. This can be accomplished by predefining travel times between every possible location in the defined area, but when dealing with a large set of locations, this option is no longer efficient. In this case a method for dynamically discovering a location and determining its relationship to other locations is required. The flexibility of this method can also allow the possibility of feeding the model a different set of locations for different results.

Disclaimer:

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The formula for determining how many potential travel paths is n(n-1)/2, where n is the number of locations. In the case where 10 potential locations are used, there are 45 distance combination calculations which must be pre-computed and stored for use within the model. For 1000 potential locations, there are just under a half million combinations. It is obvious that it doesn't take much more before it is no longer an optimal option to pre-calculate all travel paths. Of course that is unless you are guaranteed to use a significant portion of those paths during the course of the model run. In an environment where potential locations for movement or task performance becomes overwhelming, a method of dynamic travel and distance calculation is necessary in order to limit processing time. Most process modeling is associated with an existing CAD drawing, such as a Navy ship or a large commercial or military complex. While an aircraft carrier can contain several thousand locations, the path combinations are restricted by ship design and rules set up for personnel movement. In stead of a half million path combinations, we are actually only interested in a couple thousand.

In order to limit the number of calculations without limiting the model or simulation to a fixed ship/facility design, a method to extract location information from a drawing and perform distance and path calculations is necessary. By parsing a CAD file and extracting walls, doors, and other information, it is possible to keep your model flexible while still accomplishing the same task. Feature extraction allows the model to utilize any drawing information without manual interpretation or intervention. In this case the information is travel related.

The "CAD Interpreter" was designed specifically for use within a Navy simulation of aircraft maintenance onboard an aircraft carrier. The core of the CAD Interpreter is a tool which allows a developer to extract specific information from a drawing programmatically, primarily through search functions. Many of the drawings contain information such as square footage, location or labeling. While the client expected an implementation specific to their needs onboard Navy vessels, Infotek International Inc. produced a generic library useful for almost any CAD file. The generic nature of the information extraction has allowed the library to be used with several different versions of drawings where different configurations were available and where the information within the drawings had changed.

Modeling and simulation efforts in all industries, where the domain space is defined in a CAD drawing, will benefit from our feature extraction library. Through the use of this library, organizations can save time and money developing simulations. Infotek International Inc. has already used this product to assist the Navy in an analysis of work locations throughout their latest aircraft carrier. The library has also been successfully integrated into two other products still in use today by the Navy. Analysis of work environments, offices, campus layouts, airports, and supply depots can be done in less time and with fewer resources.