PHYSICS PROBLEM SOLVING: ISAAC-II

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ISAAC-11, a program which solves physics problems stated in English, will be denonstrated in real tine. A notebook of problens which have been solved by the progran will be displayed; the denonstration will include problens taken from this set. In addition, new problems in elenentary physics (stated entirely in English, i.e., not requiring a diagram as part of the problen statenent) contributed by conference attendees will be accepted, and will be attenpted by the progran.

This program, a successor to our earlier ISAAC program, first parses the sentences of the problen statenent to build an internal nodel of the objects in the problen and their relationships; this nodel is stated In terns of real-world objects (cars, people, etc.). Using rules which exanlne qualitative and quantitative features of objects and relationships, the progran chooses views of objects (or groups of objects) as physical systems (e.g., "rigid body" or "uniforn acceleration fron rest"). This set of nodels gives rise to a set of equations which can be solved to find the answer to the problen. The Internal nodel of the objects is also used to generate a picture of the problen; an exanple of such a picture (generated by ISAAC) is shown In Figure 1.

The major difference between this progran and ISAAC lies (n the choice of problem solving methods. ISAAC could solve only rigid body statics problens (which limited the range of solution methods needed); it also wrote a large nunber of equations which were solved by brute force. ISAAC-11 has a larger repertoire of problen solving methods (even for the "sane" type of problen); this enables it to select the best nethod for a particular problem. The resulting solutions are less conplex algebraically, and are closer to the solutions produced by hunan experts.

Physics problen solving is an inportant research area because the techniques used for solving physics problens, when fully developed, can aid teaching of physics and can be used for intelligent conput er-aided engineering analysis and design.

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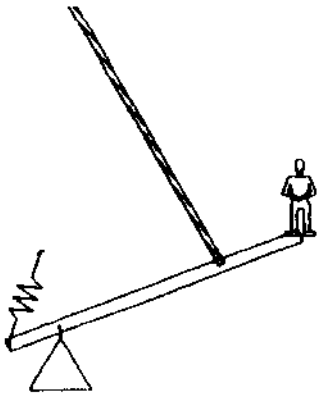

(THE LEFT END OF A BEAM IS SUPPORTED BY A SPRING WITH A CONSTANT OF 50 LB/FT)(THE SPRING MAKES AN ANGLE OF 70 DEGREES WITH THE HORIZONTAL , WHILE THE BEAM MAKES AN ANGLE OF 20 DEGREES WITH THE HORIZONTAL)(A BOY WEIGHING 50 LB STANDS AT THE RIGHT END OF THE BEAM , AND A WEIGHT OF 200 LB IS ATTACHED 2 FT FROM THE LEFT END)(THE BEAM IS SUPPORTED BY A ROPE WHICH MAKES AN ANGLE OF 120 DEGREES WITH THE HORIZONTAL)(THE ROPE IS ATTACHED 3 FT FROM THE RIGHT END)(HOW MUCH IS THE SPRING STRETCHED , AND WHAT IS THE LENGTH OF THE BEAM)
ANSWER: 3.263518 FT , 11.21168 FT

Figure 1: Example Problen and Solution