



# SNS COLLEGE OF TECHNOLOGY

COIMBATORE-35



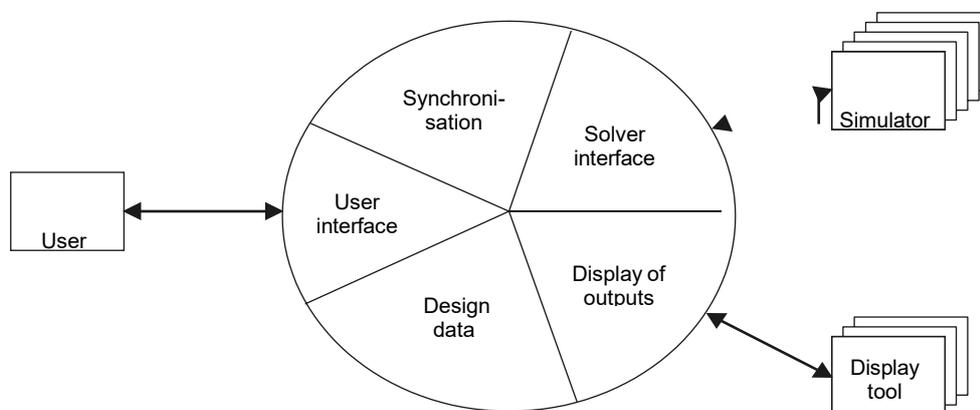
## DEPARTMENT OF MECHATRONICS

### SIMULATOR COUPLING

The option of simulator coupling tackles the problem highlighted above in a straightforward manner. Appropriate simulators are already available for the various domains in the system and in the ideal case these would only have to exchange their current simulation results. The use of simulator coupling can protect investments in models and facilitate the use of the best available simulator for a field. However, simulator coupling is also associated with a whole range of problems. For example, it generally requires access to the internals of the simulators involved, which means that if commercial simulators are to be considered, the co-operation of the provider in question is required. Furthermore, the coupled simulation forms a very intricate software package, which is difficult to get to grips with. Perhaps the most important disadvantage, however, lies in the synchronisation of two normally very different simulator cores. In the coupling of analogue electronics and mechanics, differential equations are solved in both cases. However, their origin, nature and formulation are very different. Furthermore, this form of co-simulation is also associated with convergence problems, particularly in the case of a strong coupling between two analogue solvers.

#### *Simulator backplane*

When coupling two simulators, the principle of ‘simulator backplane’ represents a particularly systematic solution. This principle is equally suited to the coupled simulation of exclusively continuous, exclusively event-oriented or mixed systems. In principle, the simulator backplane is a standardised procedure for the inclusion of simulators into an overall simulation, The main task of a backplane is to undertake a partitioning of the design data before the actual simulation and to assign the individual parts of the simulators in question. The backplane also looks after the synchronisation between the linked simulators and the exchange of data. In the ideal case the backplane also has a unified user interface with the associated output tools, but this tends to be rare.



Structure of a simulator backplane

Otherwise, the corresponding settings in the individual simulators are used, which often leads to confusion. The data exchange between the backplane and the simulators can take place by means of an IPC interface.<sup>1</sup> This does not necessarily require that all simulators are processed on the same workstation. The load can be distributed across various computers as long as the synchronisation does not prevent this. However, the cost of communication via this comparably slow interface has to be borne. Faster simulations are generally achieved by the binding together of backplane and simulators into an overall programme. This is particularly true if a great deal of communication via the backplane is expected as a result of a strong coupling between domains in the simulated system, because in this case the addressing of a simulator from the backplane becomes a function call.