Many countries have made vast advances in national
development through appropriate and timely science and
technology interventions. Most important among these
initiatives is research, which leads to innovations and a
knowledge economy. Today, researchers depend heavily
on computer modelling and simulations to study and
research into the dynamic behaviour of real systems.

Computer modelling is a powerful research tool
available to scientists to study the behaviour of systems
in areas such as agriculture, water resources, weather and
climate, economy, energy systems and environmental
pollution, among others whose performance depends
on multiple dynamic variables acting simultaneously.
To carry out such studies, it is essential to develop
computer-based models, which express the response as
a function of each of the variables. However, to develop
such models, it is important to carry out field studies
and determine the response to changes in each of the
parameters separately. The forecasting of important
socio-economic systems is important for understanding
future trends of the contributions of such systems to the
national economy. Computer modelling thus becomes an
essential tool for research-based national planning.

In many instances where computer models are used
by researchers and planners in the country to study the
performance of various systems in different areas, the
general practice is to make use of propriety software
available as commercial products. These software
packages in addition to being expensive, have a limited
validity period necessitating regular revalidation and
cannot be shared. They may also not fully suit the specific
requirements of the researcher. The source-code of these
software packages is not generally made available to
users, which disallows them making necessary changes
to the software themselves.

Hence, the best option is for the researchers to develop
their own software and computer models to suit the specific
requirements. This necessitates the researchers to express
their findings on response-stimulus relationships into
mathematical expressions, and the computer scientists to
convert these sets of mathematical expressions into an
algorithm and a computer programme working jointly.
Much financial resources and time could be saved by
experimentation using computer models. Our scientists
should therefore develop competency to develop such
models as part of their research training, similar to
acquiring training in the application of statistics, which
has become the standard practice today.

Today, computer literacy is a requirement for all
students. However, such knowledge is in most cases
limited to using standard software packages for various
applications. This is inadequate for research scientists.
Computer modelling for researchers should go beyond
using the standard software packages. It is a multi-
faceted exercise, which could be best carried out jointly
by researchers, mathematical scientists and computer
scientists working as a team in order to solve specific
problems. Computational science has now become a sub-
discipline within each scientific discipline.

As stated previously, computer modelling and
simulation use computers to represent the dynamic
behaviour of real systems. Simulation uses a mathematical
description, or model, of a real system in the form of a
software system. When the software system is run, the
resulting mathematical dynamics form an analog of the
behaviour of the real system, with the results presented
in the form of data. A simulation can take the form of
computer graphic visualization, which represents the
dynamic behaviour of the real system in graphical form.

A major advantage of a simulation system is that it
can be used to study the dynamic behaviour of systems in
situations, where real systems cannot be easily or safely
applied. Computer modelling and simulation can also be
used to understand and evaluate ‘what-if’ case scenarios.
Some examples of computer simulation familiar to most
of us include weather forecasting, flight simulators, ship
handling and driving simulators. In the medical field graphical anatomy visualization and virtual surgery are widely used simulations. The availability of advanced mobile devices with many sensors and internet capability, several mobile based simulations such as virtual tour, interactive mobile virtual environments have also been developed.

The Modelling and Simulation Group of the University of Colombo School of Computing (UCSC) is engaged in many collaborative simulation research studies. These studies include ‘ViduSayura’ a ship handling simulator (Sandaruwan et al., 2012), ‘Siyara’ a harbour environment simulation and management system (Gunasekera et al., 2012), an artillery gun firing simulation and a fighter jet cockpit simulation. A virtual environment visualization system, ‘Virtual-Eye’ has also been developed, which can be used to visualize virtual environments on mobile devices (Ranaweera et al., 2012).

This has been made possible because of the capability and skills of the staff at the UCSC in the development of software, computer modelling and simulation. It is the responsibility of every university and research institute to provide their staff with similar knowledge, skills and training to develop the software needed for computer modelling and simulation, which the researchers could apply in their own studies.

REFERENCES


N.D. Kodikara