

Computer diligence for civil engineers essay



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General characters desired in computers are speed, accuracy, reliability, versatility and diligence. It can store huge volumes of data and with the aid of many Input and output devices data of different forms can be fed in to and taken out. There are many software packages available in the market exclusively for Civil Engineers. They can be put to use for many uses like design of huge structures, virtual reality, solving equations for optimization of resources tender bidding, earth-work estimation, cost estimation, project management, structural drawing predictive model making and much more. Computers also aid satellite surveying.

Data transfer, its interpretation and analysis are all done by computers. It helps making of maps, deciding of highways alignment etc very easy for civil engineers. The paper deals with many types of software available in the market as tools for Civil Engineers. Among them, the most popular ones are, Auto CIVIL (Civil engineering with Auto CAD), STEAD/Pro (Structural Analysis And Design), AD Home Architect Deluxe (Dream Home), NANAS (Structural Analysis). Computers these days have advanced very much and with the advent of powerful PCs and Internet, computer has become an immensely useful tool for anyone in any field.

With the advent of Internet, which is often called as mankind's greatest invention till date, it has yielded very much for the civil engineers. There are many portals dedicated for civil engineers alone. There are construction site updates in the net. With the arrival of E-commerce, the computers have avoided the hassle of traveling to shops to buy goods like cement, timber etc. Civil engineers have one of the world's most important jobs; they build our quality of life with creativity and technical skill.

The civil engineers plan, design, construct and operate the facilities essential to modern life, ranging from houses, bridges and highway systems to water treatment plants and energy facilities. The civil engineers meet the challenges of pollution, traffic congestion, drinking water and energy needs for present and future generations. The paper discusses recent applications of computer in the field of civil engineering and addresses the role of rendering and providing technical advice online.

With the technological revolution and world's increasing population great threat is posed on natural resources and local environment. The role of planners becomes important and they need to improve the design skills and construction management techniques in a cost effective manner to make our world a better place to live. Civil engineering is the profession focuses on analysis, design, construction and maintenance of buildings, bridges, transportation systems, water and wastewater systems, and other infrastructure of direct relevance to society's well-being.

More recently, amidst growing awareness on environmental protection, this profession is also entrusted with safeguarding the natural environment around us to promote sustainable development. In all modern scientific and technological endeavors, computers and software play an increasingly important role. Computers can be used to generate models of complex physical processes, which can be solved using numerical methods. In almost all the different aspects of Civil Engineering, it is virtually impossible to escape the application of computer technology.

This application of computers in Civil Engineering goes beyond the normal black-box application and requires an engineer to be intelligent and cogent user in order to derive physically sound design and analysis. For example, repetitive and highly involved calculations based on regulatory (Indian standard) code may be needed in the design of multistoried buildings where the tolerance of error is very low; probability modeling may be required in the design of transportation systems, dams and bridges etc. And analysis of new class of problems in civil engineering with project management techniques (PERT /CPM).

Very rapid progress has been achieved in the last few years in the development of behavior of engineering structures. At the same time transferring information over the internet has started to play an important role in achieving economy in the design process as well as delivering engineering solutions efficiently and promptly making it easier for project managers to meet critical deadlines and obtaining/providing technical advice online, as well as collaborating and participating in discussion sessions. This is not just about saving time and money.

The Web gets creative too. One of the most widely used software tools in the civil engineering profession is computer-aided design (CAD) software which enables engineers to create 3D models, 2D drawings, and schematics of their designs, satellite surveying, data transfer, structural and fluid behavior modeling etc. There are number of portals and websites dedicated for civil engineers. Computers: Computers data handling and analysis capacity have increased rapidly and used in all branches of engineering for design, optimization and innovation as a tool.

The computational capabilities are listed. Information processing and calculation are done by computers at a very high speed. It can execute millions of instructions in a fraction of a second. For example, if we want to design a multistoried building, to do the analysis and design, we need a group of engineers working together for weeks together. But in a computer, you need a single person with software knowledge and the results in relatively less time. Satellite surveying is conducted for map preparation and other projects like highway alignment.

Satellite surveying without computers is quite difficult to imagine. Since most of the work is done by the host of computers on board and in ground station. The camera in the satellite is completely controlled by the computer. The photograph taken by satellite will be converted into digital images and sent to earth. At the ground station, the receiving end, there is a computer, which interprets the data and gives us the real image as taken. The photograph taken can be used as a base map and for other purposes like military use since everything will be in the proper scale.

Without the aid of satellite surveying, it would take many weeks and huge manpower to do the work and that too ends up with many kinds of errors.

Condition Monitoring of Structures: The bridges and other structures are decaying at a very faster rate than expected. These structures need constant monitoring. With suitable hardware support (measurement devices like smart materials, strain gauges, thermometers, environmental devices etc) and suitable instrumentation, these structures can be monitored and required alarms can be triggered for safety.

The advantage is that it can take into account multi criteria, for example in case of a bridge deflection of the span, sinking of pier, flood inundation decay, bulking of pier etc. Multitudinously and substitute them in the any complex stability equation given and come out with the results in no time. It can monitor and indicate the time when additional progressing is required in SC structures. Probes like deflection gauges can be implanted at different points of a buildings at the time of natural disaster like earthquake, cyclone etc. You can artificially make for study purpose) These outputs can be fed into a computer and a data base can be made and learnt. The designers can further modify designs economically, to notation these hazards safely in future. In another case a probe can be set upstream in case of a submersible bridge and traffic ICC can be blocked in time. Monitoring hydraulic structures is a work, which can be done by computer brilliantly. The whole administration with a number of probes in the catchments area can be very well administered.

In a project, the regulatory odds can be beaten using software with simulation models. The probability of disputes can be predicted and thereby handled off actively. There are risk management softwares, which can redirect the amount of risk involved in a project very realistically, with which the management can take decisions freely actively. Figure 1 Health monitoring of a Bridge using smart material sensors Software: There are many types of software available in the market as tools for Civil Engineers.

Among them, the most popular ones are: ; Auto CIVIL (Civil engineering with Auto CAD) ; STEAD/Pro (Structural Analysis And Design) ; AD Home Architect Deluxe (Dream Home) ; NANAS (Structural Analysis) Auto Civil uses Auto

CAD in civil engineering field. The usual areas of its use are a) Roadway design)
Hydraulics The digital terrain modeling can be done with Auto contour and
Auto DOT M in which generation of contour map, point interpolation, AD
residual cut and fill map and even the volume calculations can be done. The
roadway design can be done with great ease with Auto roads, which is
developed only for this purpose.

Similarly Outwear, Outhouses and Adjustors are the packages, which deal
with water supply, sewage, transport and drainage works respectively. The
power tool for Computerized Structural engineering STEAD. Pro is the most
popular structural engineering software product for AD del generation,
analysis and multi-material design. It has an intuitive, user-friendly GU',
visualization tools, powers LU analysis and design facilities and seamless
integration to several other modeling and design software products. The
software is fully compatible with all Windows operating systems(Figure 2).

For static or dynamic analysis of bridges, containment structures, embedded
structures (tunnels and culverts), pipe racks, steel, concrete, aluminum or
timber buildings, transmission towers, stadiums or any other simple or
complex structure, STEAD. Pro has been the hospice of design proof
sectionals around the world for their specific ICC analysis needs. Figure 2.
Shear Force and Bending Moment Diagram from STEAD. Pro AD Home
Architect Deluxe creates complete, proof seasonal-looking residential floor
plans that let you design a remodel, an addition, or even an entire home. D
Home Architect Deluxe simplify less the task of accurately drawing plans,
letting you experiment with possible alternatives and convey your ideas to
others. It displays multiple, independent windows, so you can have several
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views of a single plan open at once (for example, Plan, Cross-section/Elevation, and Camera views), plus several versions of each view Figure 3 (for example, Camera views from two angles), and even several different plans (to compare designs). The program is designed in such a way that we can create objects or carry out commands, like drawing walls, placing windows, and changing views.

Dimension lines locate walls and openings in walls by showing how far one wall is from another, or how far an opening is down a wall. We can create interior and exterior dimension lines. Using landscape we can create our own dream house. Some of the drawings from the AD Home Architect is given below. Figure 3 This dimensional drawing using AD Home Architect The NANAS program has many finite-element analysis capabilities, ranging from a simple, linear, static analysis to a complex, nonlinear, transient dynamic analysis.

NANAS provides specific ICC procedures to perform analyses for different engineering disciplines. Figure 4. Analysis in NANAS The process involves three general tasks Building the Model, Applying Loads and Obtaining the Solution, Reviewing the Results. Building a finite element model requires more of your time than any other part of types, element real constants, material properties we can model the geometry using preprocessor. In the next step, the analysis type and analysis options is defined indeed by applying loads, load step options and initiate the finite element solution.

We choose the analysis type based on the loading conditions and the response you wish to calculate. For example, if natural frequencies and mode

shapes are to be calculated, you would choose a modal analysis. You can perform the following analysis types in the NASTRAN program: static (or steady-state), transient, harmonic, modal, spectrum, buckling, and substructuring. After the solution has been calculated, the postprocessor is used in NASTRAN to review the results. We can obtain contour displays, deformed shapes, and tabular listings to review and interpret the results of the analysis.

Concluding Remarks The rapid progress that has been achieved in the last few years in the development of general-purpose engineering software as well as the technology of transferring information over the internet has started to play an important role in achieving economy in the design process as well as delivering engineering solutions efficiently and promptly making it easier for project managers to meet critical deadlines and obtaining/providing technical advice online, as well as collaborating and participating in discussion sessions.