Systems Control and the Internet

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Abstract

Some aspects of the Internet impact on the systems control are presented in this paper. Particularly will be discussed the influence on industrial process control and expert systems life cycle. The Internet affected the industrial process control in several ways although this field is very conservative. Internet changes development and usage of the control software. Development, implementation as well as maintenance of the control software are faster and cheaper. The Internet capabilities are additional features of the process control system. They expand possibilities of some process control systems and made them more efficient and attractive for the end users.

Keywords: systems control, Internet, industrial process control, knowledge based systems.

1 Introduction

The Internet has already changed many everyday processes, such as buying and making decisions. Also expectations of the process control software end users grown exceedingly. The way of thinking of the computer users and software developers is essential changing. Internet changes information landscape indeed. We are only just beginning to realise the extent of these changes. Figures 1 and 2 are based on data produced by Network Wizards. On figure 1 we can see rapid grow of the Internet hosts in the last six years.

We are going to discuss some aspects of the Internet impact on the systems control. Particularly we will focus on the impact of the Internet technology on the industrial process control and the usage of the knowledge based systems. Figure 2 shows, that companies are the largest class of users. It is difficult to estimate how often they are using Internet linked to the industrial process control. Without any doubt Internet capabilities have a great influence on process control. Let us bring forward some of them:

- knowledge attainability world-wide,
- multimedia documents transfer,
- distant supervision,

- expert advice availability,
- impact on knowledge bases.

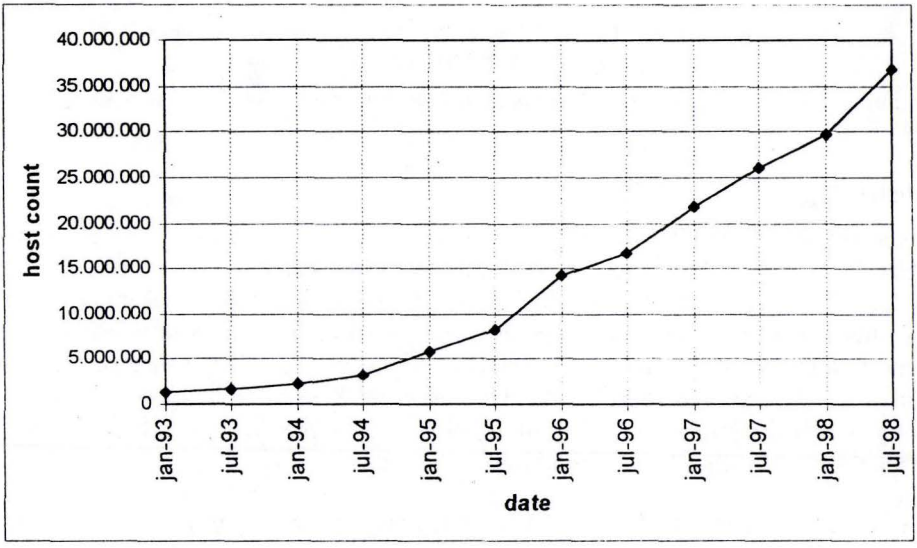

Fig. 1: Internet hosts.

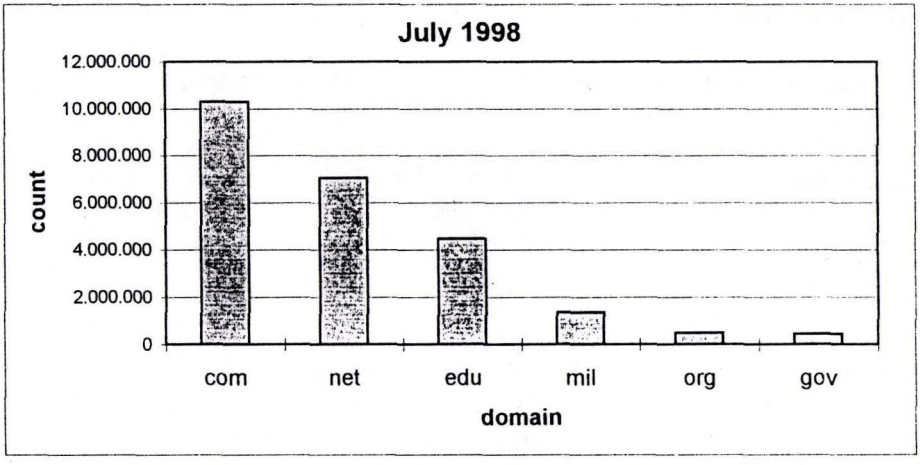

Fig. 2: Internet domains.

Internet let individuals share what they know. But it is not limited to human connections. Knowledge could be find in numeric computer data located wherever. Present knowledge discovery tools focus on turning data into knowledge. Other important sources of knowledge include text based information. A number of systems help users to

generate knowledge from text. Internet essentially enlarged possibilities for connecting people and knowledge based computer systems to knowledge.

Multimedia document transfer could be very useful attribute in cases when such data are required or desired, because textual data transfer is inconvenient. Distant supervision is important for end user as well as for developer of the system. It is serviceable in phase of developing and maintenance. Multimedia data transfer also supports availability to get expert advice in particular cases.

2 Systems Control

From the cybernetics point of view, the internet allows to have exceedingly spacious system. There is also a new quality of relations. The system is not necessarily bigger, but the abilities of the controller are much more extensive. Figure 3 presents common control loop with additional connection to the outside world, offered by the Internet technology.

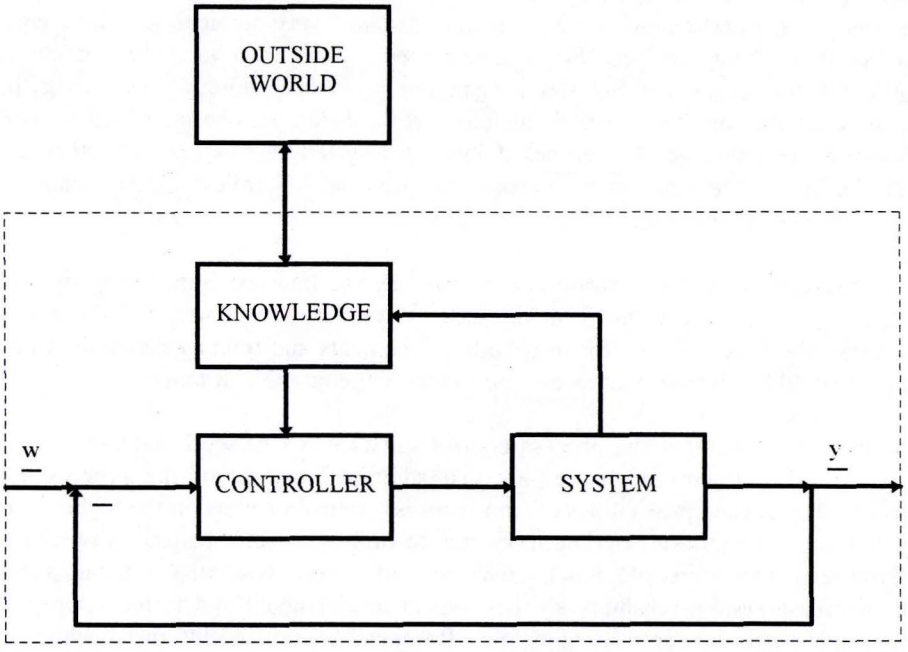

Fig. 3: Control system.

There is more information available for the controller. A knowledge domain for the controller could be bigger. It does not matter if it is a fuzzy logic, artificial neural network or expert system based controller.

The Internet could have an impact to entire life cycle of the process control software. We divide software life cycle into: development phase, operation phase and maintenance phase. The following discussion treats knowledge based systems, however it is valid for other kinds of software too.

In the development phase the Internet or a company Intranet capabilities bring possibilities for faster developing process. Commercial software for managing Web-based design is already available. Data exchange between developing team and system design is enabled although engineers are working at scattered work sites. For example file transfer protocol is one of Internet tools to be used for this purpose. Slow network connection could significantly degrade the development tool's run time performance. During the control system development is accessibility of the plant expert of the prime importance. Usage of the Internet brings a big time and money savings by the expert co-operation. In some cases developed prototype could be evaluated from distant - Internet technology shortens the distance between plant and system engineer.

Operation phase is common stage of the control software. For the users is sometimes possibility for process monitoring from long distance very serviceable. Many engineer tasks could be done remotely. So engineers need no longer to be at their offices every working minute of the day. Solution is again the Internet technology. Accessibility of the foreign databases and the expert knowledge world-wide could be important in cases of the learning expert systems. Web-based library is a system that makes material accessible over the Web. The material is available to everyone, regardless of its location, and without the need for them to know where it is.

Also maintenance of the software is influenced by the Internet. Supervising of the final system operation is possible from distance as well as downloading of the debugged program. The Web is handy for distributing documents and training materials. End user support could be given instantaneous, no matter on geographic distance.

It should be noted, that the process control software has to work independent of the Internet. The Internet capabilities are just additional feature of the process control system. They expand possibilities of some process control systems on the higher levels of the control - monitoring, optimisation and co-ordination and manager decision level. Internet capabilities are additional subsystem within process control machine software, they decrease system reliability so they should be debugged and tested appropriately. Important is also data security viewpoint. Response time of the Internet facilities is not predictable although whole net is designed to be resistant against crash down. Anyway, response time sometimes made Internet facilities unserviceable in hard real time applications.

3 The Industrial Process Control Capabilities

In last few years fast and ascendant progress of the information and telecommunication techniques strongly influenced also the industrial process control although this field is very conservative. The capabilities of the high levels of the industrial processes were extended enormous. Almost every system for supervisory control and data acquisition should incorporate some Internet capability. Remote control becomes very remote due to the new technology. Maintenance of the production systems becomes cheaper because system's operation could be easily supervised from a big distance. Remotes diagnose strongly reduce costs of the maintenance. Necessary time for software error debugging is substantial shortened. Present realisations show, that Internet capabilities could be used for remote hardware errors detection too. The software upgrading through the Internet is also possible and becomes reality because Internet is a new medium of software distribution. Alarming system is more structured, sophisticated and effective.

Beside monitoring level also levels of optimisation, co-ordination and management benefit a lot from the Internet, for example, Internet-based collaboration tools enable decentralised decision making. Transfer of the knowledge is of a great significance. Internet makes possible universal access to the data. It also provides access to information in general - not just information in written form. On the other hand is use of the Internet in the industrial process control limited with questions of the ownership of the data and their accuracy. Another important fact is, that the Internet is a dynamic environment. The requirement for real time response is not possible to meet, because responsible time is varying on the level of the congestion. Therefore the Internet capabilities could be included in the process control only where strictly response time is not necessity, or as additional feature of the process control software.

4 Conclusion

Fast developing field of the Internet and related hardware and software technologies already have strong impact on the systems control. They influenced development, implementation, maintenance, and also end user requirements and expectations. For example 56 Kbps modems technology has standard and analogue modems are still expected to be the primary means of access to the Internet for the near future, despite the growth of alternative faster digital technologies. The number of hosts connected to the Internet is continuously growing in an exponential way since the beginning of the nineties. We can expect increased application of the Internet services as: WWW, Gopher, FTP, TELNET, mail, lists, and news. Available are Internet related tools for software development as well as for knowledge management. The traffic on the Internet steady increases. A large, globally accessible information space is provided. This encourages us to exchange various forms of data and knowledge through the Internet and use capabilities of it for the process control, although this demand new solutions from technicians. End user will gain from the Internet technologies: it will be easier to choose

software products for process control, novelties will be disseminated faster and hardware and software maintenance will be easier. Probably costs for process control will not decrease - lower expenses for software will compensate costs for additional Internet related hardware and software equipment.

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