

## MAN-MACHINE SYSTEMS — INTRODUCTION AND BACKGROUND

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**Abstract.** This paper is an introduction to the IFAC/IFIP/IFORS/IEA Conference on Analysis, Design, and Evaluation of Man-Machine Systems. It serves as an outline for the survey papers and topic areas of the conference. Therefore, it is very broad in its scope and condensed in its exposition. The man-machine system is defined, its general purpose explained, and the multitude of application areas stated. The historical and scientific background of the field is briefly outlined. Human task categories in man-machine systems are described.

**Keywords.** Man-machine systems; manual controls; optimal control models; supervisory controls; operations research; methodological; problem solving; human-computer interaction; software ergonomics; human reliability; social effects of automation.

### DEFINITION AND PURPOSE OF MAN- MACHINE SYSTEMS

A man-machine system is defined as a functional synthesis between a biological/psychological/social system (the man or a group of people) and a technological system (the machine) characterized predominantly by the interaction and functional interdependence between these two. All kinds of technological systems regardless of degree of complexity may be part of a man-machine system, e.g., industrial plants, vehicles, manipulators, prostheses, computers or management information systems. For the interaction with such systems, mostly psychological but also social aspects are of concern. Task categories like controlling and problem solving describe typical human activities in man-machine systems. Later on, these task categories will be explained in more detail.

The overall purpose of any man-machine system is to provide a certain function, product or service as an output with reasonable costs, even under conditions of disturbance influencing man, machine or both (see Fig. 1). The main goals or inputs of a man-machine system are expected values of performance, costs, reliability, and safety. At least since some spectacular accidents have occurred with aircraft and nuclear power plants, reliability and safety have become vitally important operational as well as design goals in addition to performance and costs; see Sheridan (1982). Also, an acceptable level of workload and job satisfaction of the man should be maintained; see, e.g., Moray (1979).

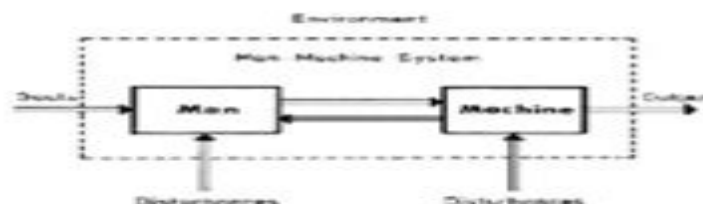


Fig. 1. Man-Machine System (MMS)

Some of these goals are in conflict with each other. Such conflicts have to be resolved in the most favorable manner by the designers of a particular man-machine system. Any deficiencies left to the human user of such systems may cause poor performance, job satisfaction, and safety.

The interaction between man and machine is the essential aspect of a man-machine system. Classical ergonomic aspects like knobs and dial design, anthropometry, lighting, or adverse environmental factors have intensively been investigated. Many results are available, although not always applied appropriately. In contrast, the focus of attention has centered on informational aspects in the last years. Questions of concern to a successful interaction between man and machine are:

What kind of information is needed?

How should the information be organized?

# Man Machine Systems

**Henry Mcllvaine Parsons**



## **Man Machine Systems:**

**Analysis, Design & Evaluation of Man-Machine Systems** G. Mancini, L. Martensson, G. Johannsen, 2014-06-28  
Provides a valuable overview of human machine interaction in technological systems with particular emphasis on recent advances in theory experimental and analytical research and applications related to man machine systems Topics covered include Automation and Operator task analysis decision support task allocation management decision support supervisory control artificial intelligence training and teaching expert knowledge System Concept and Design software ergonomics fault diagnosis safety design concepts Man machine Interface interface design graphics and vision user adaptive interfaces Systems Operation process industry electric power aircraft surface transport prostheses and manual control Contains 53 papers and three discussion sessions

**Analysis, Design and Evaluation of Man-Machine Systems 1992** H.G. Stassen, 2014-06-28 Containing 4 plenary papers and 38 technical papers this volume contributes to the literature on the important subject of man machine systems The many topics discussed include human performance skills knowledge engineering and expert systems training procedures human performance and mental load models and human machine interfaces

**Analysis, Design and Evaluation of Man-Machine Systems 1988** J. Ranta, 2014-06-28 This volume provides a state of the art review of the development and future use of man machine systems in all aspects of business and industry The papers cover such topics as human computer interaction system design and the impact of automation in general and also by the use of case studies describe a wide range of applications in such areas as office automation transportation power plants machinery and manufacturing processes and defence systems Contains 73 papers

*Analysis, Design and Evaluation of Man - Machine Systems* G. Johannsen, J. E. Rijnsdorp, 2014-05-16 Analysis Design computer aided control station with coloured display for production control dynamic and static models for nuclear reactor operators ironies of automation and theory and validation of model of the human observer and decision maker The operation simulation for the evaluation and improvement of a medical information system are fully covered An in depth account of an online information retrieval through natural language is provided The control of input variables by head movements of handicapped persons is completely presented A chapter is devoted to a graphical hardware description language for logic simulation programs Another section focuses on the symbiotic knowledge based computer support systems The book can provide useful information to computer programmers engineers students and researchers

**Man-machine System Experiments** Henry McIlvaine Parsons, 1972

**DDC Retrieval and Indexing Terminology** Defense Documentation Center (U.S.), 1975

*Man-machine Systems* William Thomas Singleton, 1974

*Analysis, Design, and Evaluation of Man-machine Systems, 1989* Baosheng Hu, 1990 The twenty seven papers cover recent advances in both empirical and theoretical aspects of man machine interaction with special emphasis on the subjects of man automation and man computer interaction They provide information on a subject which has grown rapidly in importance during recent years

**1970 (eleventh) Symposium on**

**Man Machine Systems** ,1970      *Advances in Man-Machine Systems Research* William B. Rouse,1985-11      ... *Progress report of the Man-Machine Systems Group ...* ,      **Verification and Validation of Complex Systems: Human Factors Issues** John A. Wise,V.David Hopkin,Paul Stager,2013-06-29 Despite its increasing importance the verification and validation of the human machine interface is perhaps the most overlooked aspect of system development Although much has been written about the design and development process very little organized information is available on how to verify and validate highly complex and highly coupled dynamic systems Inability to evaluate such systems adequately may become the limiting factor in our ability to employ systems that our technology and knowledge allow us to design This volume based on a NATO Advanced Science Institute held in 1992 is designed to provide guidance for the verification and validation of all highly complex and coupled systems Air traffic control is used as an example to ensure that the theory is described in terms that will allow its implementation but the results can be applied to all complex and coupled systems The volume presents the knowledge and theory in a format that will allow readers from a wide variety of backgrounds to apply it to the systems for which they are responsible The emphasis is on domains where significant advances have been made in the methods of identifying potential problems and in new testing methods and tools Also emphasized are techniques to identify the assumptions on which a system is built and to spot their weaknesses      Scientific and Technical Aerospace Reports ,1987

**Handbook of Human-Machine Systems** Giancarlo Fortino,David Kaber,Andreas Nürnberger,David Mendonça,2023-07-25 Handbook of Human Machine Systems Insightful and cutting edge discussions of recent developments in human machine systems In Handbook of Human Machine Systems a team of distinguished researchers delivers a comprehensive exploration of human machine systems HMS research and development from a variety of illuminating perspectives The book offers a big picture look at state of the art research and technology in the area of HMS Contributing authors cover Brain Machine Interfaces and Systems including assistive technologies like devices used to improve locomotion They also discuss advances in the scientific and engineering foundations of Collaborative Intelligent Systems and Applications Companion technology which combines trans disciplinary research in fields like computer science AI and cognitive science is explored alongside the applications of human cognition in intelligent and artificially intelligent system designs human factors engineering and various aspects of interactive and wearable computers and systems The book also includes A thorough introduction to human machine systems via the use of emblematic use cases as well as discussions of potential future research challenges Comprehensive explorations of hybrid technologies which focus on transversal aspects of human machine systems Practical discussions of human machine cooperation principles and methods for the design and evaluation of a brain computer interface Perfect for academic and technical researchers with an interest in HMS Handbook of Human Machine Systems will also earn a place in the libraries of technical professionals practicing in areas including computer science artificial intelligence cognitive science engineering psychology and neurobiology      Nuclear Safety ,1983

**Intelligent Help Systems for UNIX** Stephen J. Hegner, Paul Mc Kevitt, Peter Norvig, Robert L. Wilensky, 2012-12-06 In this international collection of papers there is a wealth of knowledge on artificial intelligence AI and cognitive science CS techniques applied to the problem of providing help systems mainly for the UNIX operating system The research described here involves the representation of technical computer concepts but also the representation of how users conceptualise such concepts The collection looks at computational models and systems such as UC Yucca and OSCON programmed in languages such as Lisp Prolog OPS 5 and C which have been developed to provide UNIX help These systems range from being menu based to ones with natural language interfaces some providing active help intervening when they believe the user to have misconceptions and some based on empirical studies of what users actually do while using UNIX Further papers investigate planning and knowledge representation where the focus is on discovering what the user wants to do and figuring out a way to do it as well as representing the knowledge needed to do so There is a significant focus on natural language dialogue where consultation systems can become active incorporating user modelling natural language generation and plan recognition modelling metaphors and users mistaken beliefs Much can be learned from seeing how AI and CS techniques can be investigated in depth while being applied to a real test bed domain such as help on UNIX [Thesaurus of ERIC Descriptors](#), 1977 *Advances in Artificial Systems for Power Engineering II* Zhengbing Hu, Bo Wang, Sergey Petoukhov, Matthew He, 2022-03-11 This book includes refereed papers presented at the Second International Conference on Artificial Intelligence and Power Engineering AIPE2021 which was held in Moscow Russia on December 17 19 2021 The general scope of the book includes the most recent advances in the development of artificial intelligence systems and their applications in a variety of fields ranging from power engineering to biology and education Given the rapid development of artificial intelligence systems the book emphasizes the importance of intensifying training for a growing number of relevant specialists particularly in energy and power engineering in order to improve the effectiveness of the creation and diagnosis of appropriate technical solutions Scientists are attempting to replicate the innate intellectual abilities of humans and other organisms in digital artificial intelligence systems In depth research into biological and self organizing systems can provide new approaches for developing more and more effective artificial intelligence methods The papers included in this volume cover thematic materials in the following areas mathematics and computer algorithms analysis of some technical solutions and technological and educational approaches The book is a collection of cutting edge papers in the field covering a wide range of topics relevant to both business managers and engineering professionals These proceedings are an excellent resource for asset management practitioners researchers and academics as well as undergraduate and postgraduate students interested in artificial intelligence systems and their expanding applications due to their breadth and depth The intended readership includes specialists students and other groups of readers who want to know where artificial intelligence systems can be used to great advantage in the future **Encyclopedia of Computer Science and Technology** Jack

Belzer, Albert G. Holzman, Allen Kent, 1978-07-01 This comprehensive reference work provides immediate fingertip access to state of the art technology in nearly 700 self contained articles written by over 900 international authorities Each article in the Encyclopedia features current developments and trends in computers software vendors and applications extensive bibliographies of leading figures in the field such as Samuel Alexander John von Neumann and Norbert Wiener and in depth analysis of future directions      *Thesaurus of ERIC Descriptors* Educational Resources Information Center (U.S.), 1969 Revised edition of a dictionary of terms used in connection with library and documentation work in the broad field of education

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