

自动控制技术与人类进步

Automatic Control & Human Civilization

Part II



Googol Technology



(1) 苏联L.S. Pontryagin发表“最优过程数学理论”，提出极大值原理 (Maximum Principle)(1956)



L.S. Pontryagin

(2) 美国R. Bellman在RAND Coporation数学部的支持下，发表著名的Dynamic Programming，建立最优控制的基础(1957)



McDonnell F4 phantom aircraft with two General Electric J-79 turbojet engines.

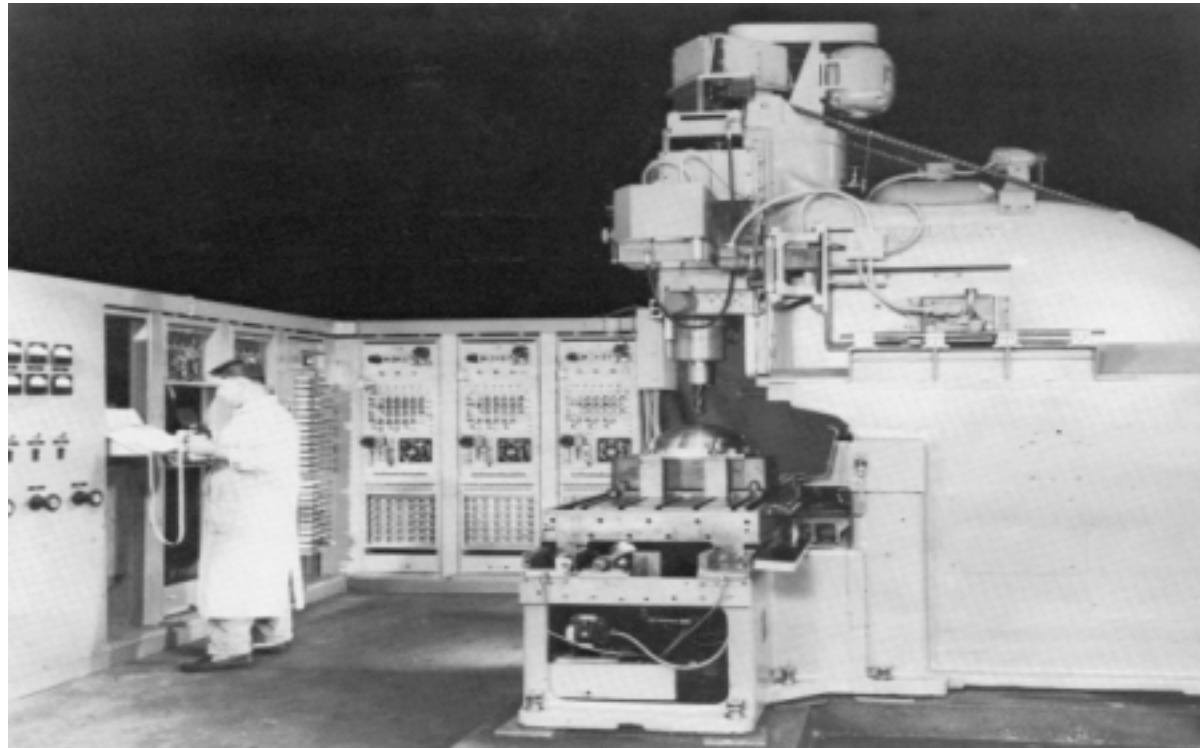


McDonnell F4 phantom aircraft launching a ground-to-air missile (courtesy of the Raytheon Co.)

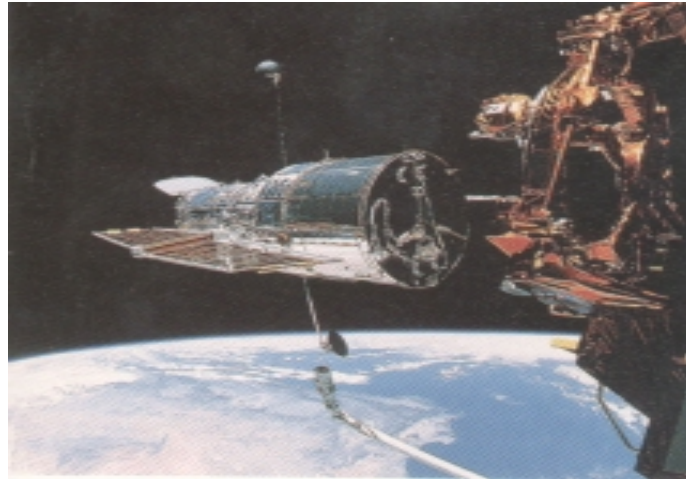
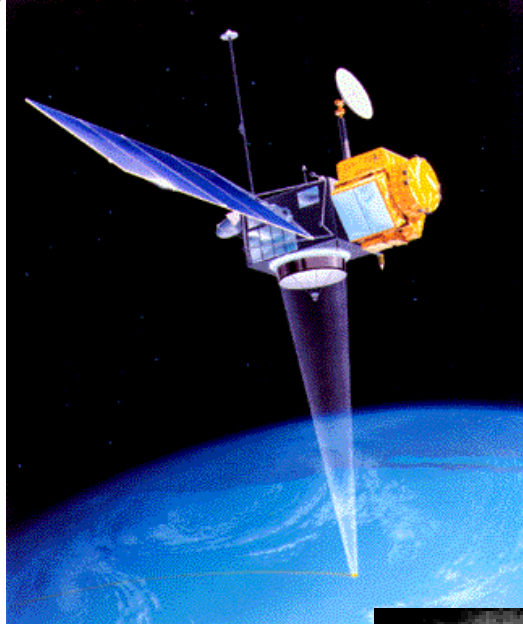
(3) 国际自动控制联合会(IFAC)成立(1957)，中国为发起国之一，第一届学术会议于莫斯科召开(1960)



(4) 美国MIT的Servomechanism Laboratory研制出第一台数控机床(1952)



(5) 世界第一顆人造地球衛星(Sputnik)由蘇聯發射成功(1957)



1957. Laika. Sputnik 2



Sputnik 1 was the first artificial satellite launched into space





Oct. 4, 1957: Launch of the rocket carrying Sputnik, the first man-made satellite. Photos of the launch were not initially released. This photo is a still from a 1967 Soviet documentary film.



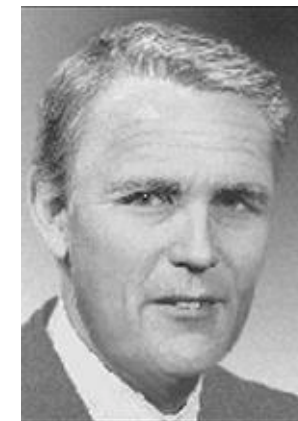
K.S. Pavlovitch(1906-1966), Russian spacecraft designer and header of the Vostok and Voskhod projects.



(6) 美国[George Devol](#)研制出第一台工业机器人样机(1954)，两年后，被称为机器人之父的[Joseph Engelberger](#)创立了第一家机器人公司，[Unimation](#)



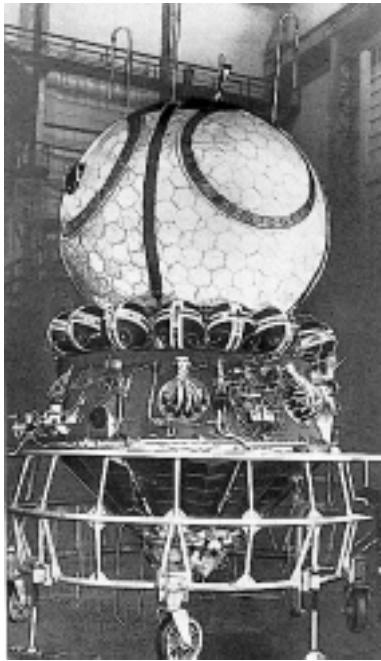
(7) 美籍匈牙利人[R. E. Kalman](#)发表“On the General Theory of Control Systems”等论文，引入状态空间法分析系统，提出能控性，能观测性，最佳调节器和kalman 滤波等概念，奠定了现代控制理论的基础(1960)



R.E. Kalman



(8) 苏联东方-1号飞船载着加加林进入人造地球卫星轨道，人类宇航时代开始了(1961)



Capsule used in first manned orbit of earth



In 1961, the first human to pilot a spacecraft, Yuri Gagarin, was launched by the Soviet Union aboard Vostok I.



宇宙哥伦布-加加林

1961, at the age of 27, Gagarin left the earth. It was April the 12th, 9.07 Moscow time (launch-site, Baikonur). 108 minutes later, he was back. The period of orbital revolution was 89:34 minutes (this figure was "calculated by electronic computers"). The missions maximum flight altitude was 327 000 meters. The maximum speed reached was 28 260 kilometers per hour.



A stamp issued by Russia to memorize Y. Gagarin



(9) 1963年, 美国的Lofti Zadeh与C. Desoer发表Linear Systems - A State Space Approach。1965年, Zadeh提出模糊集合和模糊控制概念

(10) 美国的E.I. Jury 发表“数字控制系统” (Sampled-Data Control System) , 建立了数字控制及数字信号处理的基础(1958)



Lofti A. Zadeh



C. Desoer



(11) 苏联发射“月球”9号探测器，首次在月面软着陆成功(1966)，三年后(1969)，美国“阿波罗”11号把宇航员N. A. Armstrong送上月球。



N.A. Armstrong

(12) 瑞典Karl J. Astrom提出最小二乘辨识，解决了线性定常系统参数估计问题和定阶方法(1967)，六年后，提出了自启调节器，建立自适应控制的基础。Astrom于1993年获得IEEE Medal of Honor。

(13) 英国H.H Rosenbrock发表State Space and Multivariable Theory(1970)。加拿大W.M Wonham发表Linear Multivariable Control: A Geometric Approach(1974)。

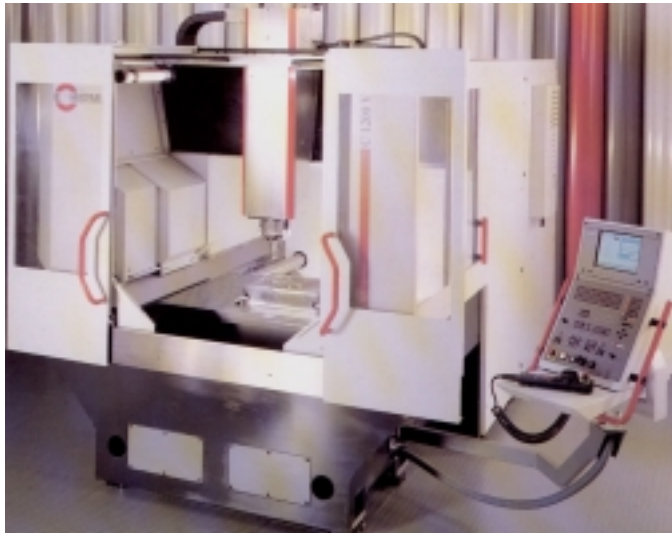


K. J. Astrom

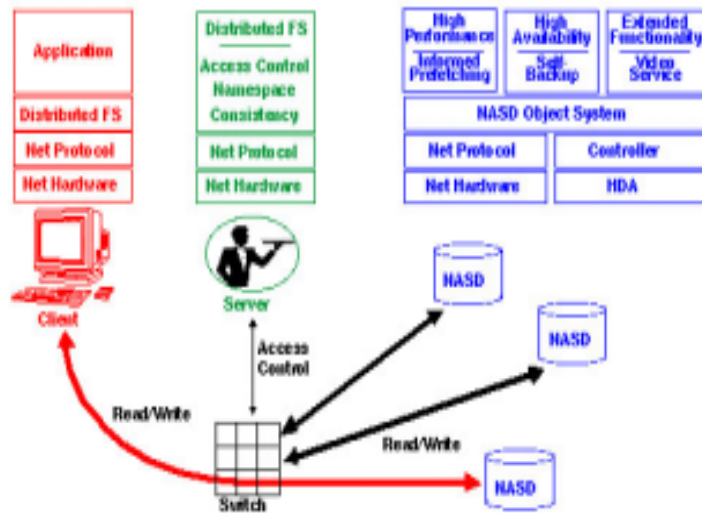


W.M Wonham

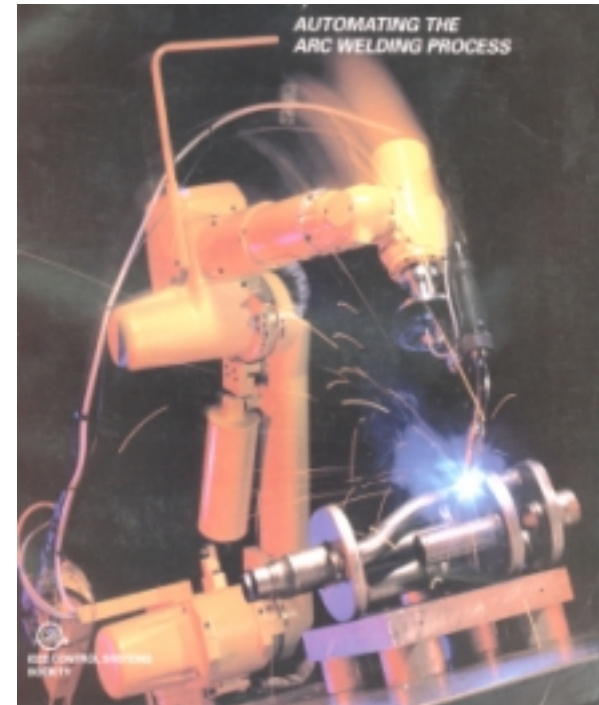
(14) 美国的M. E. Merchant提出计算机集成制造的概念(1969)



(15) 美国ARPA计算机网络初步建成(1971)



(16) 日本Fanuc公司研制出由加工中心和工业机器人组成的柔性制造单元(1976)



(17) 美国R. Brockett提出用微分几何研究非线性控制系统(1976)，意大利A. Isidori出版(*Nonlinear Control Systems*) (1985)。



From left to right, the participants of the special invited session on History of Control at the 34th CDC: S. Shahruz (session co-organizer), Irena Lasiecka, Karl Åström, Art Krener, Irwin Sandberg, Roger Brockett, Tom Kailath, and Linda Bushnell (session co-organizer).



R. Brockett



A. Isidori



(18) 加拿大G. Zames提出H_∞鲁棒控制设计方法
(1981年)

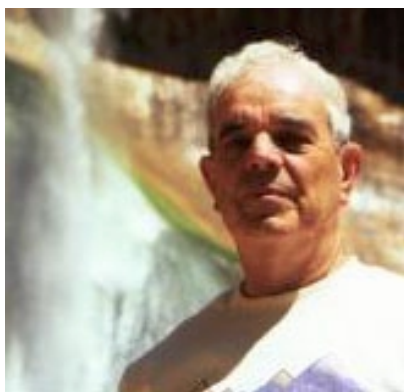


Gorge Zames

(19) 美国“哥伦比亚”
号航天飞机首次发
射成功(1981年)



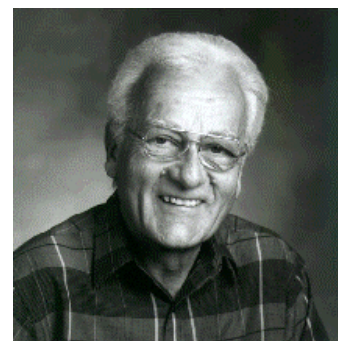
(20) 美国A. Bryson和Y.C Ho 发表Applied Optimal Control(1969)。
Y.C Ho 和X.R Cao等提出离散事件系统理论(1983)



A. Bryson



Yu C. Ho



P. Kokotovic

(21) 中国批准863高技术计划，包括自动化领域的计算机集成制造系统和智能机器人两个主题(1986)



(22) IEEE Control Systems Award 获得者。

Recipients of the Control Systems Award

1982: Howard H. Rosenbrock—for contributions to multivariable control theory and design methods

1984: Arthur E. Bryson—for pioneering contributions to optimal control and estimation and their applications

1985: George Zames—for contributions to feedback stability theory and linear multivariable control system design

1986: Charles A. Desoer—for fundamental contributions to linear system theory, linear controller design, linear and nonlinear stability analysis, and the role of feedback in nonlinear systems

1987: W. Murray Wonham—for pioneering contributions to the theory of stochastic systems, linear multivariable control, and discrete systems

1988: Dante C. Youla—for original contributions in the areas of circuits, systems and control theory, and the rigorous solution of engineering problems

1989: Yu-Chi Ho—for contributions to differential games, multi-person decision making, and discrete event dynamic systems

1990: Karl Johan Astrom—for fundamental contributions in control theory with emphasis on its practical application

1991: Roger W. Brockett—for pioneering and innovative contributions to nonlinear control, stability, robotics, and control engineering education.

1992: Harold J. Kushner—for fundamental contributions to stochastic systems theory and its engineering applications

1993: Moshe Zakai—for contributions to nonlinear stochastic analysis and its applications to control systems

1994: Elmer G. Gilbert—for pioneering and innovative contributions to linear state space theory and its applications, especially realization and decoupling, as well as to control algorithms

1995: Petar V. Kokotovic—for pioneering contributions to singular perturbation theory, adaptive systems, nonlinear controls, and their industrial applications.



(23) 第一台火星探测器Sojourner在火星表面软着陆(1996)



(24) 旅行者Voyager 一号，二号开始走出太阳系，对茫茫太空进行探索

