

Endüstriyel Otomatik Kontrol Sistemleri

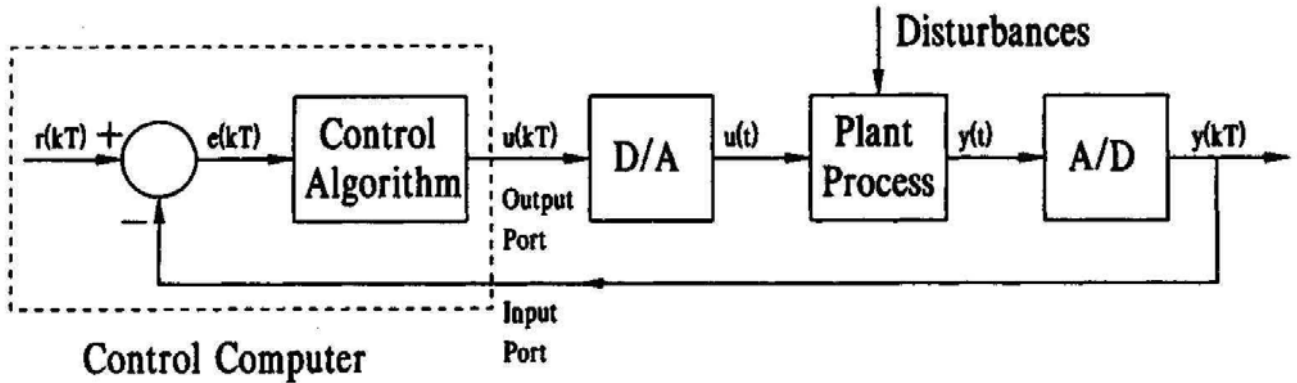
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Dersin Konusu: Mikroişlemci Temelli Sistem ile Kontrol ve Uygulamaları

Dersin Amacı:

Mikroişlemcili sistem kullanan endüstriyel otomatik kontrol sistemlerinin denetleyici özellikleri, iç donanımı ve elektronik devrelerinin incelenmesi, uygulama devrelerinin analizi, incelenmesi ve tasarlanmasının öğretilmesidir.

Mikroişlemcili Kontrol Sistemlerinin Özellikleri



PID Kontrol:

$$u(t) = K_p e(t) + K_i \int_0^t e(\tau) d\tau + K_d \frac{de}{dt}$$

Dijital Sistemlerin Transfer Fonksiyon:

$$D(z) = \frac{U(z)}{E(z)} = \frac{a_n z^n + a_{n-1} z^{n-1} + \dots + a_0}{z^n - b_{n-1} z^{n-1} - \dots - b_0}$$

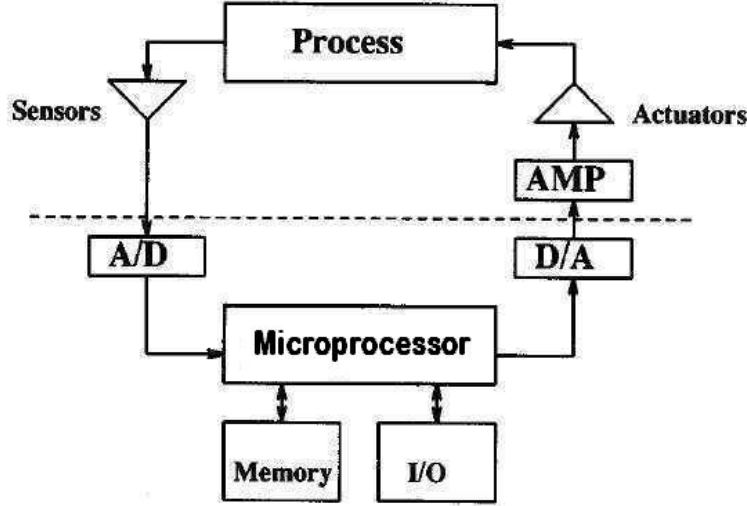
Kapalı çevrim z-domeni Transfer fonksiyonu:

$$M(z) = \frac{Y(z)}{R(z)} = \frac{G(z)D(z)}{1 + G(z)D(z)}$$

Karakteristik denklemi:

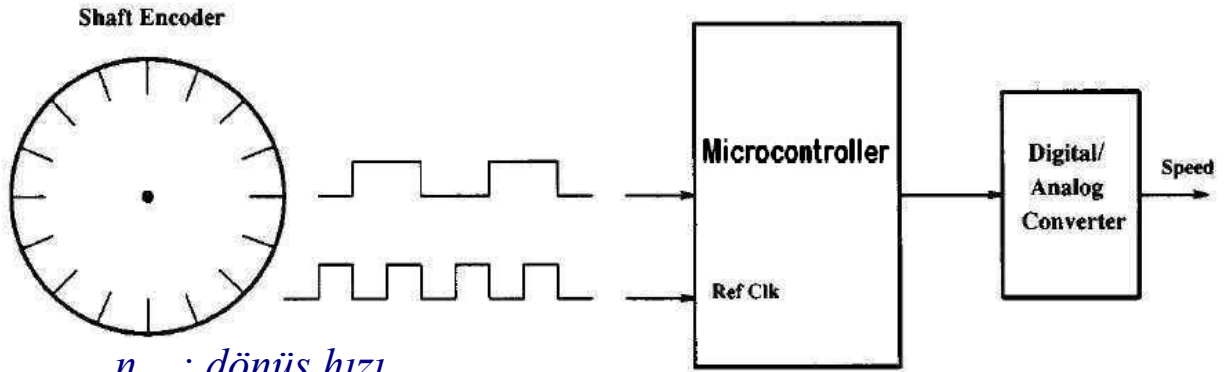
$$1 + G(z)D(z) = 0$$

Mikroişlemcili Kontrol Uygulamaları



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Devir Hızının Ölçülmesi (Donanım)



n : dönüş hızı

C_p : Kodlayıcı darbe sayısı

C_t : saat darbelerinin sayısı

m : kodlayıcı tur sayısı

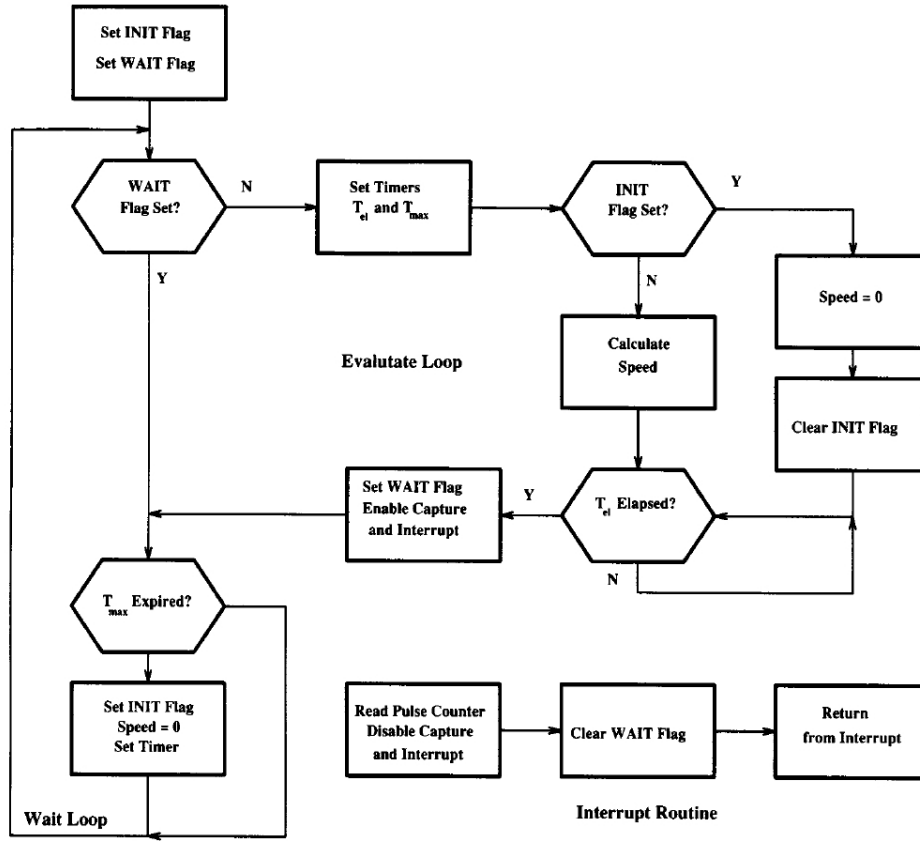
T_c : saat darbesi periyodu

$$n = \frac{C_p}{C_t m / T_c}$$

Burada kullanılan mil kodlayıcı bir turda 1024 darbe üretir.

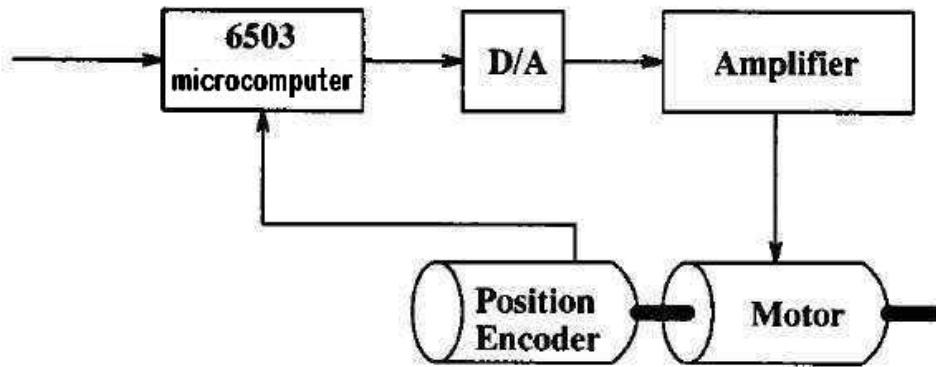
Referans saat frekansı 2 MHz, peryot 2.3 ms ise devir hızı ölçüm aralığı 25.5–4883 rpm (devir/dak.). Bağıl hata en fazla %0.123 olur.

Devir Hızının Ölçülmesi (Yazılım)

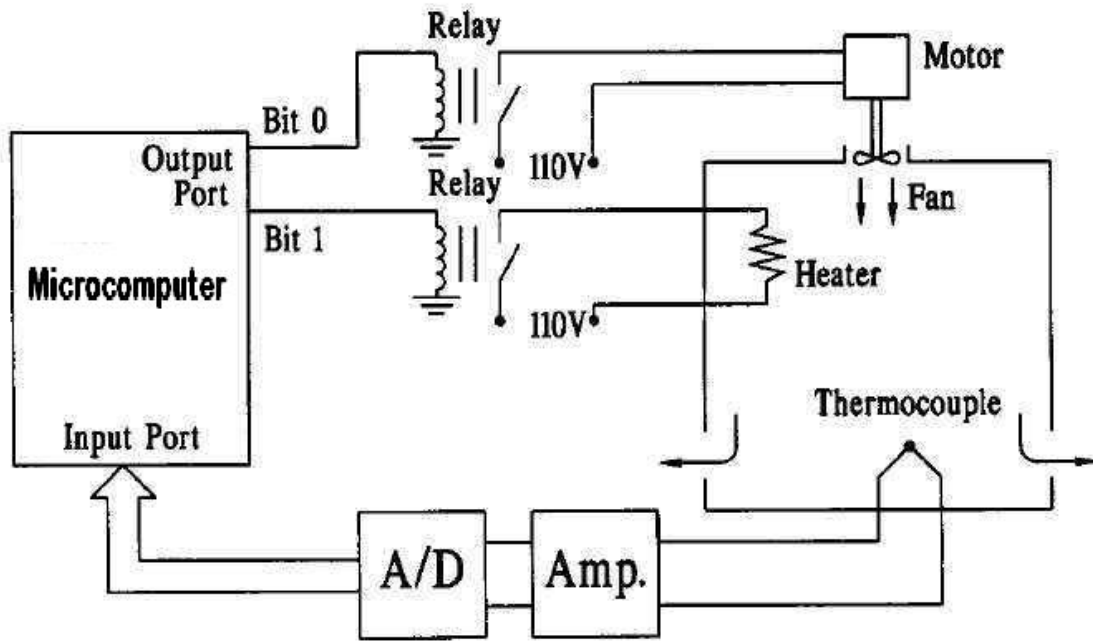


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Konum kontrol sistemi

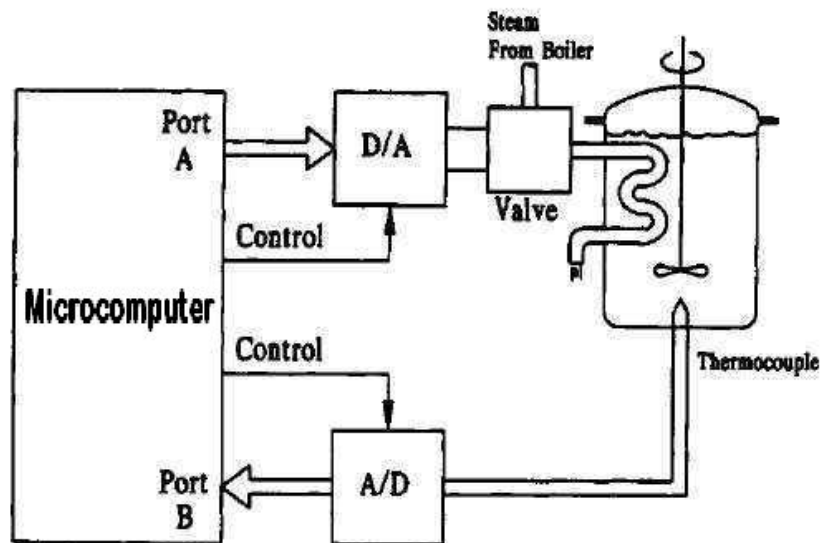


Sıcaklık ON/OFF Kontrol Sistemi

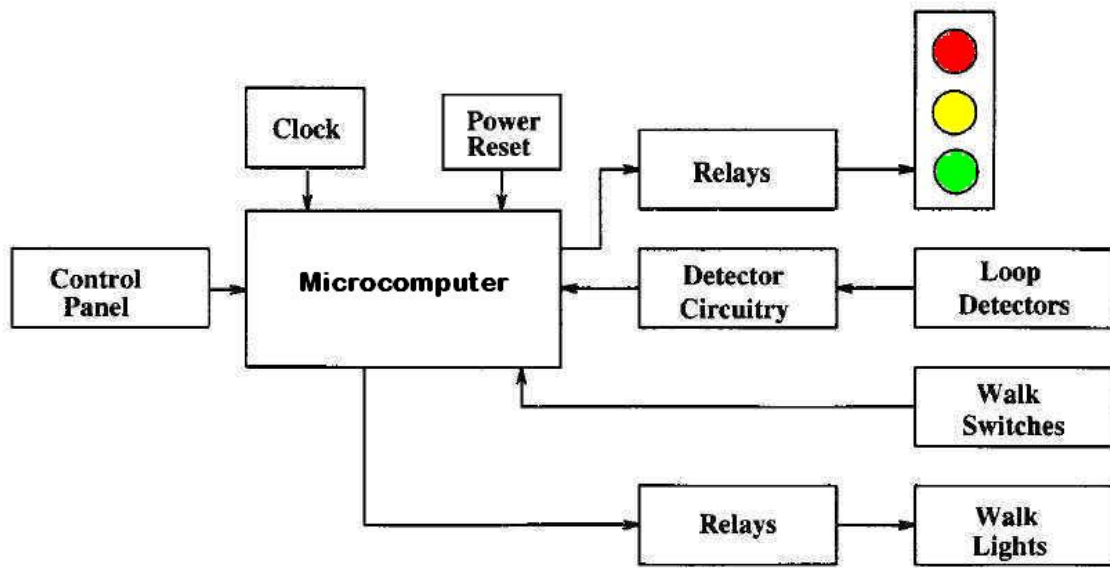


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Sıcaklık PID Kontrol Sistemi

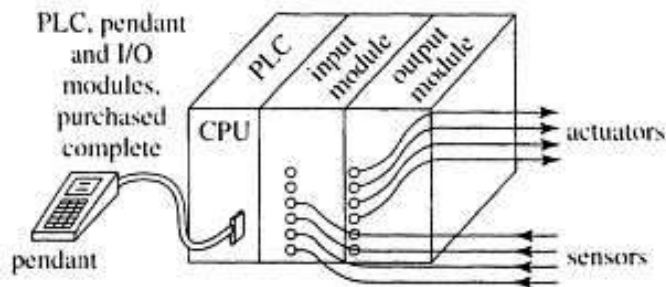


Trafik Kontrol Sistemi

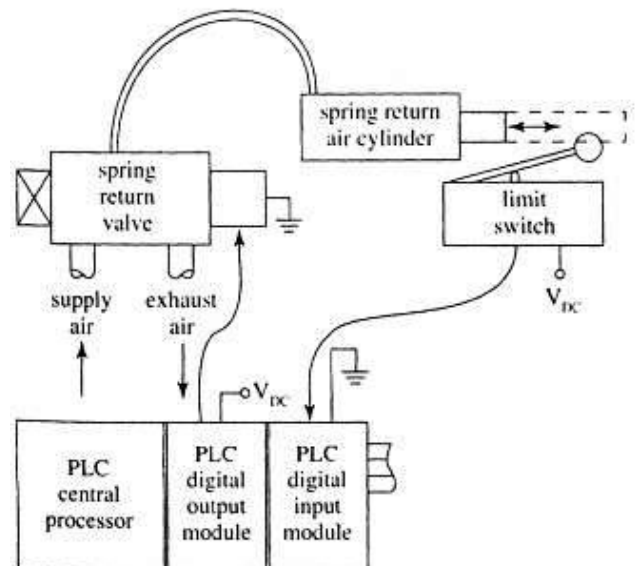
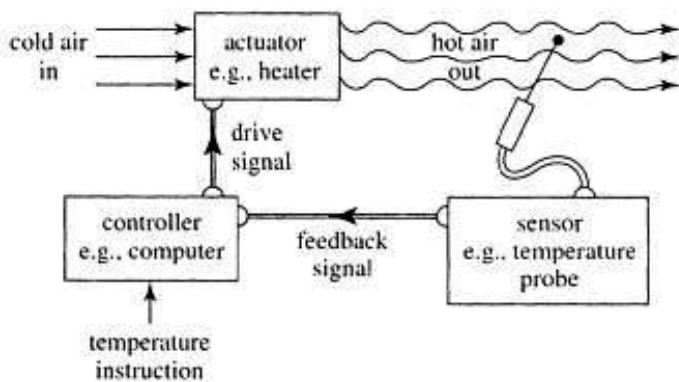


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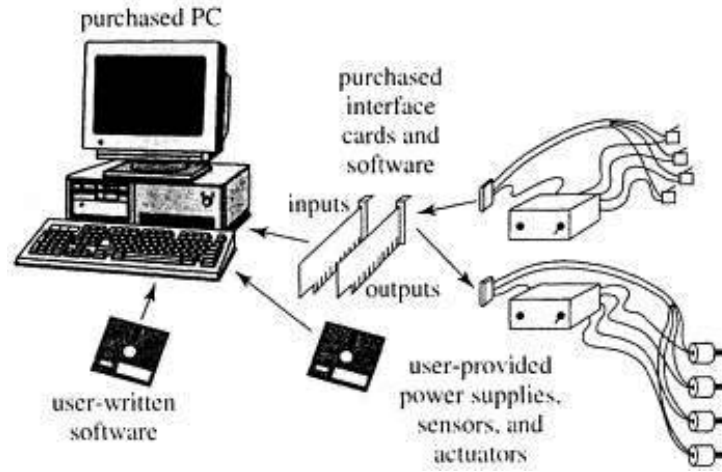
Programlanabilir Lojik Denetleyici (PLC) ile Kontrol



PLC ile Sıcaklık Kontrol uygulaması

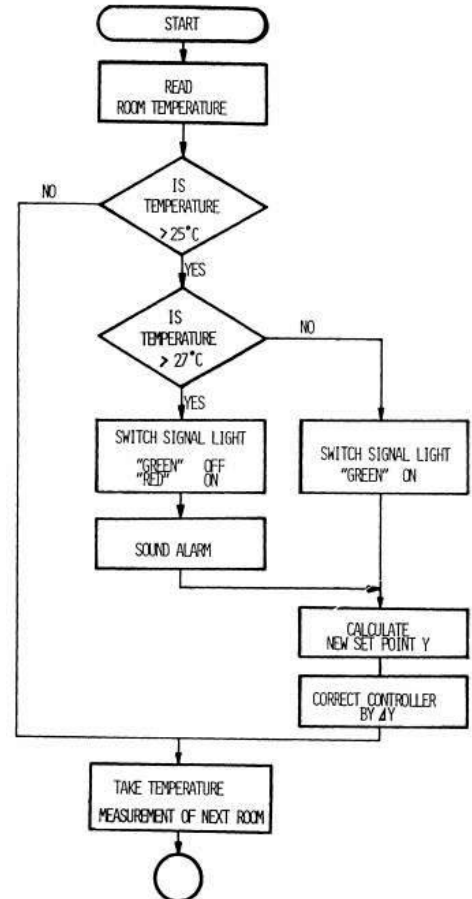
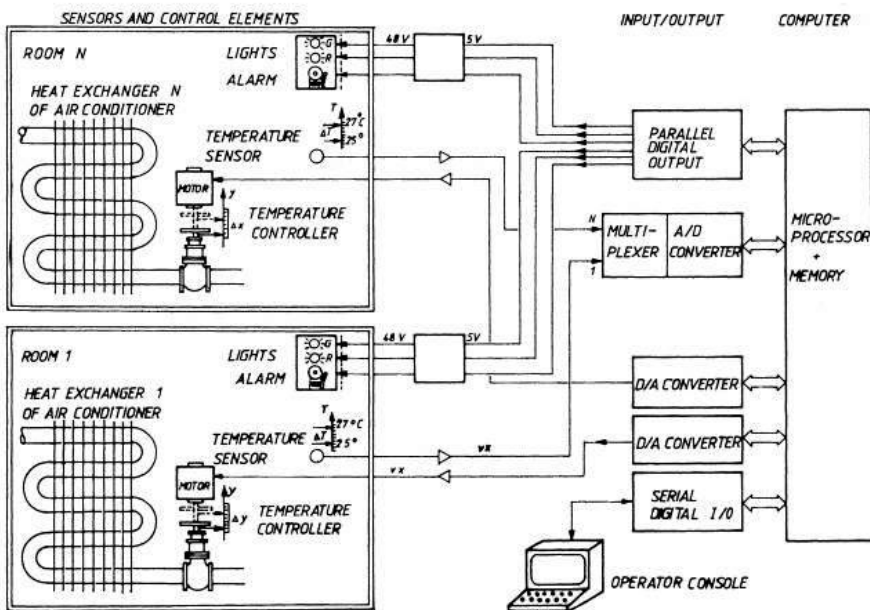


Kişisel Bilgisayar (PC) ile Kontrol



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Kişisel Bilgisayar ile Sıcaklık Kontrol Uygulaması



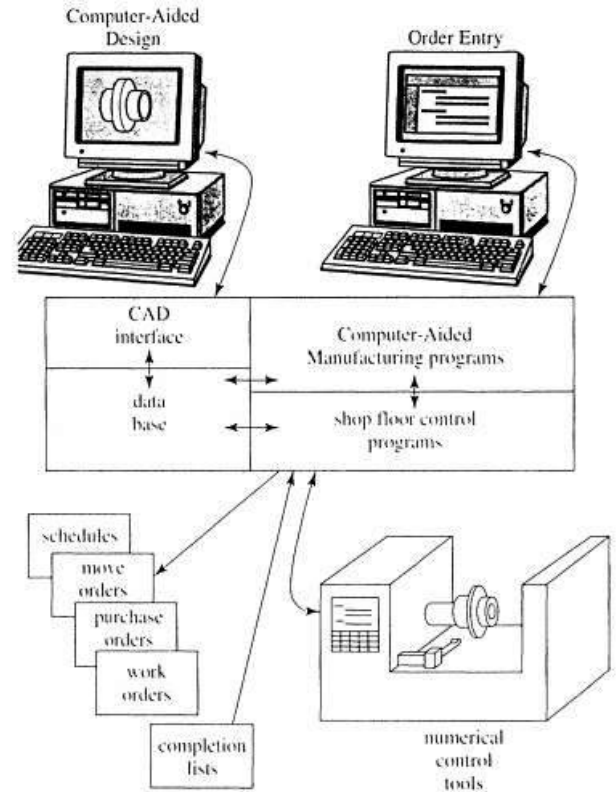
Computer Integrated Manufacturing (CIM) Systems

Computer Aided Design (CAD)

Computer Aided Engineering (CAE)

Computer Aided Manufacturing (CAM)

Computer Numerical Control (CNC)



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KAYNAKLAR

1. Otomatik Kontrol Sistemleri, Benjamin C. KUO, Literatür Yayınları, 1999
2. Modern Control Systems, Richard C. DORF, Robert H. BISHOP, Addison Wesley, 1998
3. Mikroişlemci Sistemleri, Tuncay UZUN, 2005
4. Brogan, W.L., Lee, G.K.F., Sage, A.P., Kuo, B.C., Phillips, C.L., Harbor, R.D., Jacquot, R.G., McInroy, J.E., Atherton, D.P., Bay, J.S., Baumann, W.T., Chow, M-Y. "Control Systems", The Electrical Engineering Handbook, Ed. Richard C. Dorf, Boca Raton: CRC Press LLC, 2000
5. Staudhammer, J., Chen, S.-L., Windley, P.J., Frenzel, J.F. "Microprocessors", The Electrical Engineering Handbook, Ed. Richard C. Dorf, Boca Raton: CRC Press LLC, 2000