Pengantar Kuliah

Sistem Kontrol Digital

Eka Maulana, ST., MT., MEng.

Teknik Elektro
Universitas Brawijaya

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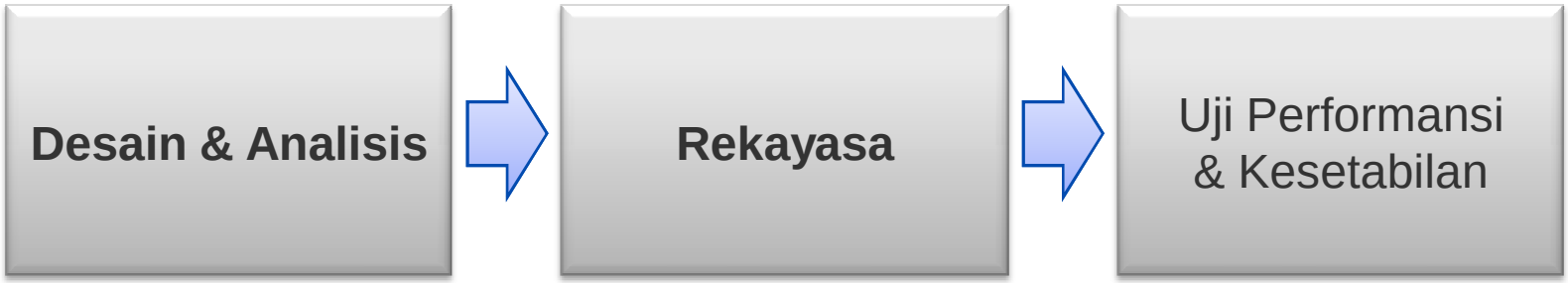
Silabus MK Sistem Kontrol Digital

- **Tujuan:**

  Memberikan kemampuan untuk menganalisis dan merancang pengendali pada sistem pengaturan loop tertutup secara digital (dengan data tersampling).



Silabus MK Sistem Kontrol Digital

Pokok Bahasan:

- Konsep Sampling dan Transformasi
- Analisis blok diagram sistem data tersampling
- Desain algoritma kontroler dengan metode transformasi;
- Desain algoritma kontroler dengan menggunakan diskrititasi;
- Analisis Performansi dan Kesetabilan Sistem.

Silabus MK Sistem Kontrol Digital

Referensi:

- Ogata, K. Discrete-Time Control Systems, Englewood Cliffs New Jersey: Prentice-Hall, Inc., 1995.
- Philip, C.L., Nagle H.T., Digital Control System Analysis and Design. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1995.
- CH Houpis, Lamont GB. Digital Control System: Theory, Hardware, Software. McGraw-Hill International Edition.

Definisi KONTROL DIGITAL?

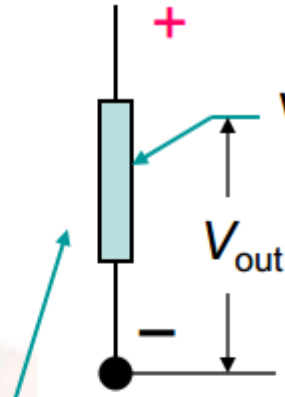
Ruang lingkup **SKD**:

- Diskrit/ tercuplik
- Rekayasa/ manipulasi
- Algoritma pengendali

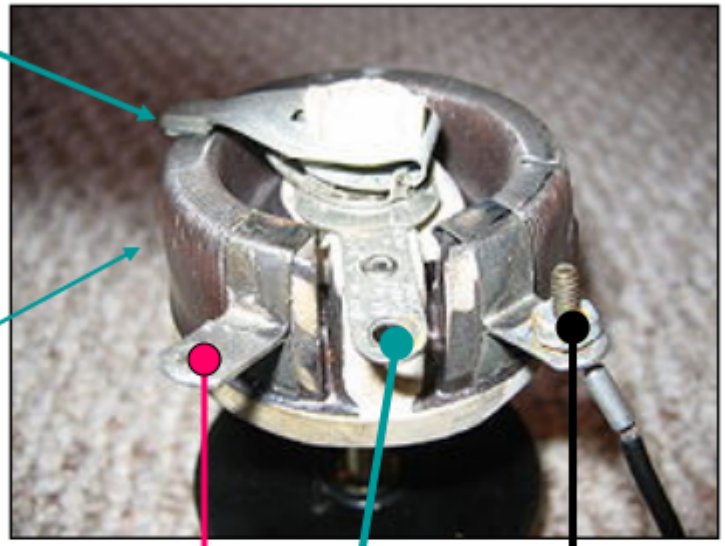
Sistem Kontrol Analog vs Digital

Analog	Digital
❑ Sinyal Kontinyu	❑ Sinyal Diskrit
❑ Pengendalian terbatas	❑ Scalable & fleksibel
❑ Kompenen sensitif	❑ Noise rendah
❑ Parameter sulit adaptif	❑ Mudah di adaptasikan
❑ Lebih banyak komponen	❑ Murah & operasi statis
❑ Integrasi rumit	❑ Mudah terintegrasi

Contoh: Tranduser Analog

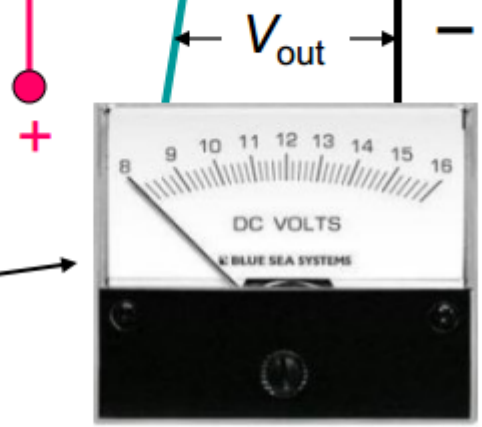


Single-turn potentiometer



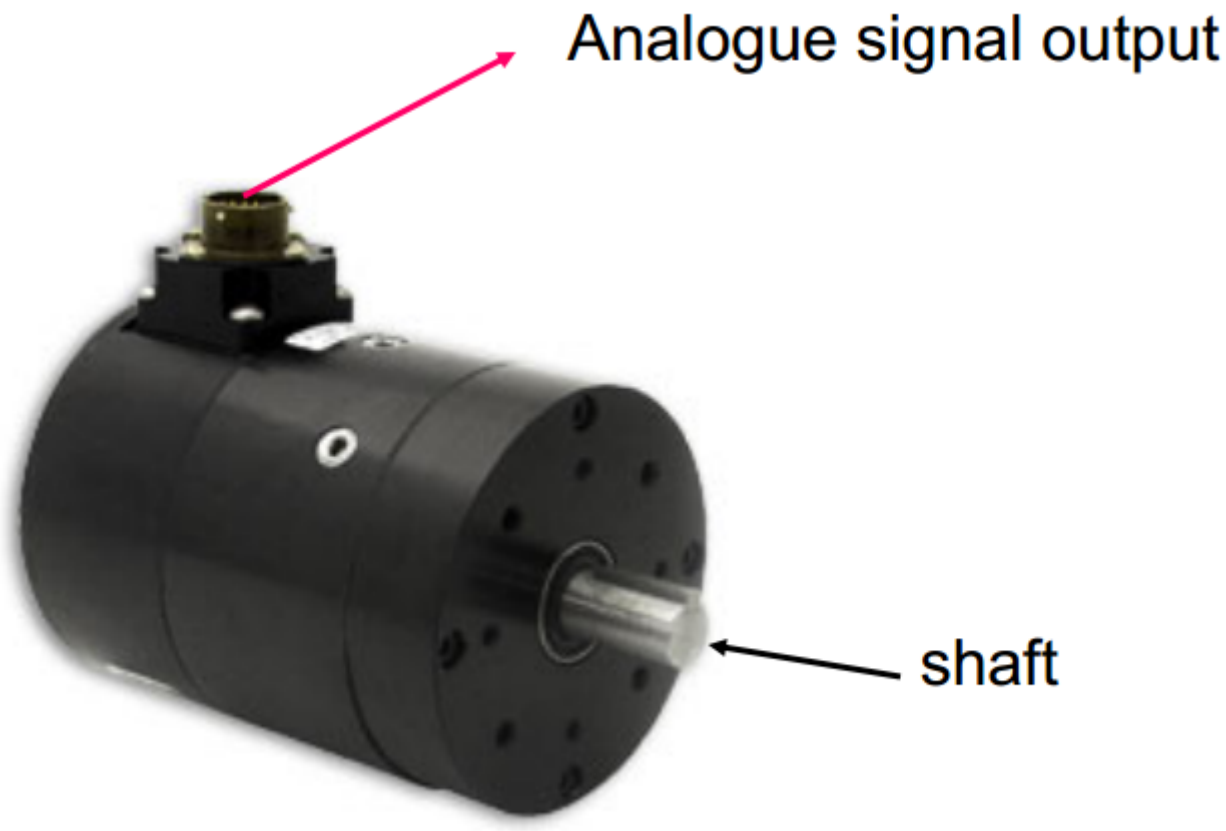
Shaft

10-turn potentiometer



Calibrated in deg gantry or collimator angle, cm couch position

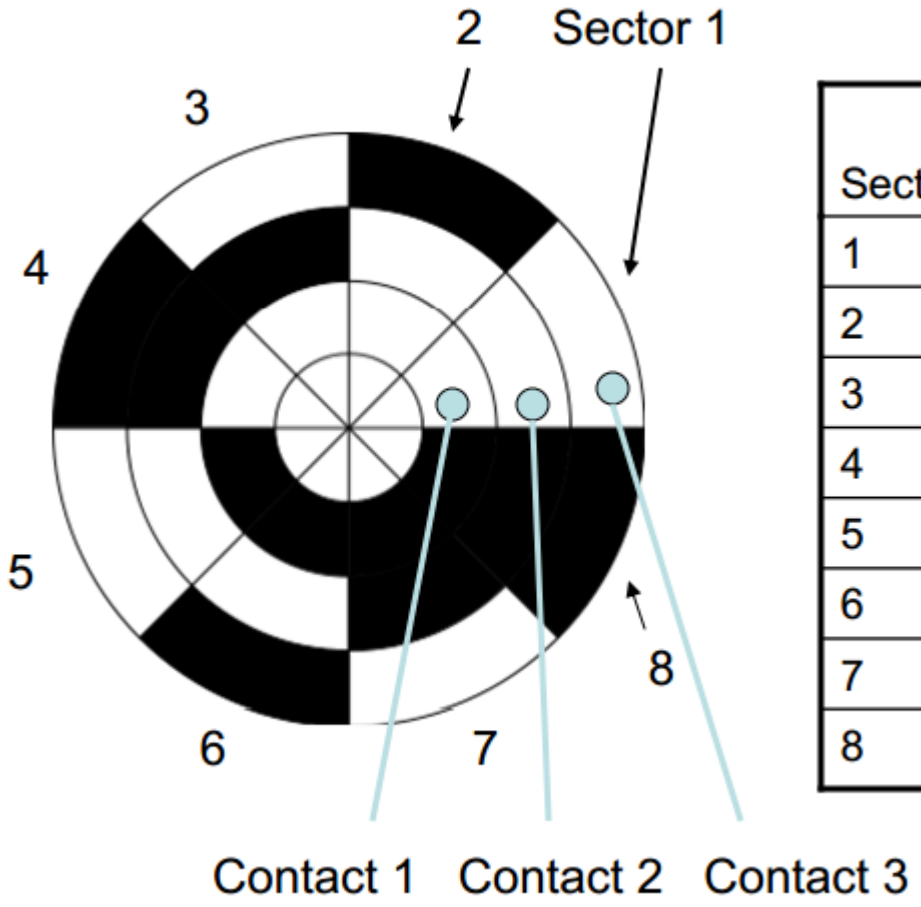
Resolver: tranduser rotari analog



Keterbatasan devais Analog

- Precision of potentiometer ~ 0.1% linearity
  - 0.4 mm for 40x40cm^2 field
  - Sensitive to small changes in wire resistance
  - Degraded accuracy by use and age (brush)
  - Sensitive to power supply voltage
- Reading accuracy ~ 0.2%
  - Digital readout - used even in early linacs

Digital Encoder: 3 bit shaft encoder

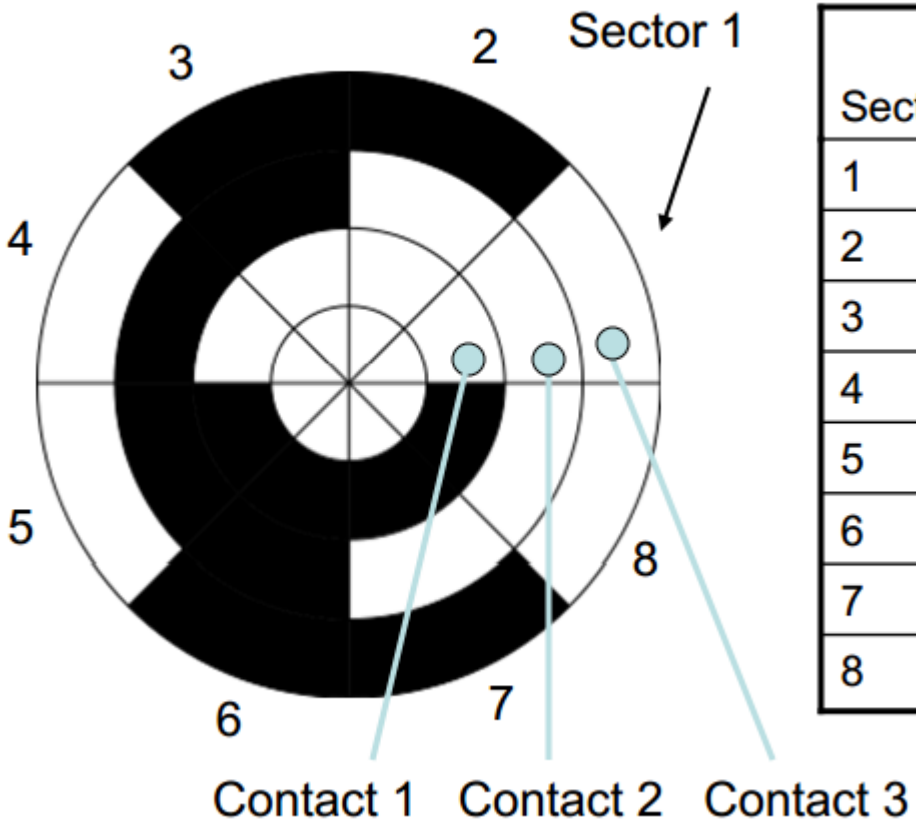


Standard binary encoding

Sector	Con-tact 1	Con-tact 2	Con-tact 3	Angle
1	off	off	off	0° - 45°
2	off	off	ON	45° - 90°
3	off	ON	off	90° - 135°
4	off	ON	ON	135° - 180°
5	ON	off	off	180° - 225°
6	ON	off	ON	225° - 270°
7	ON	ON	off	270° - 315°
8	ON	ON	ON	315° - 360°

Digital Encoder: 3 bit shaft encoder

Gray encoding



Sector	Con-tact 1	Con-tact 2	Con-tact 3	Angle
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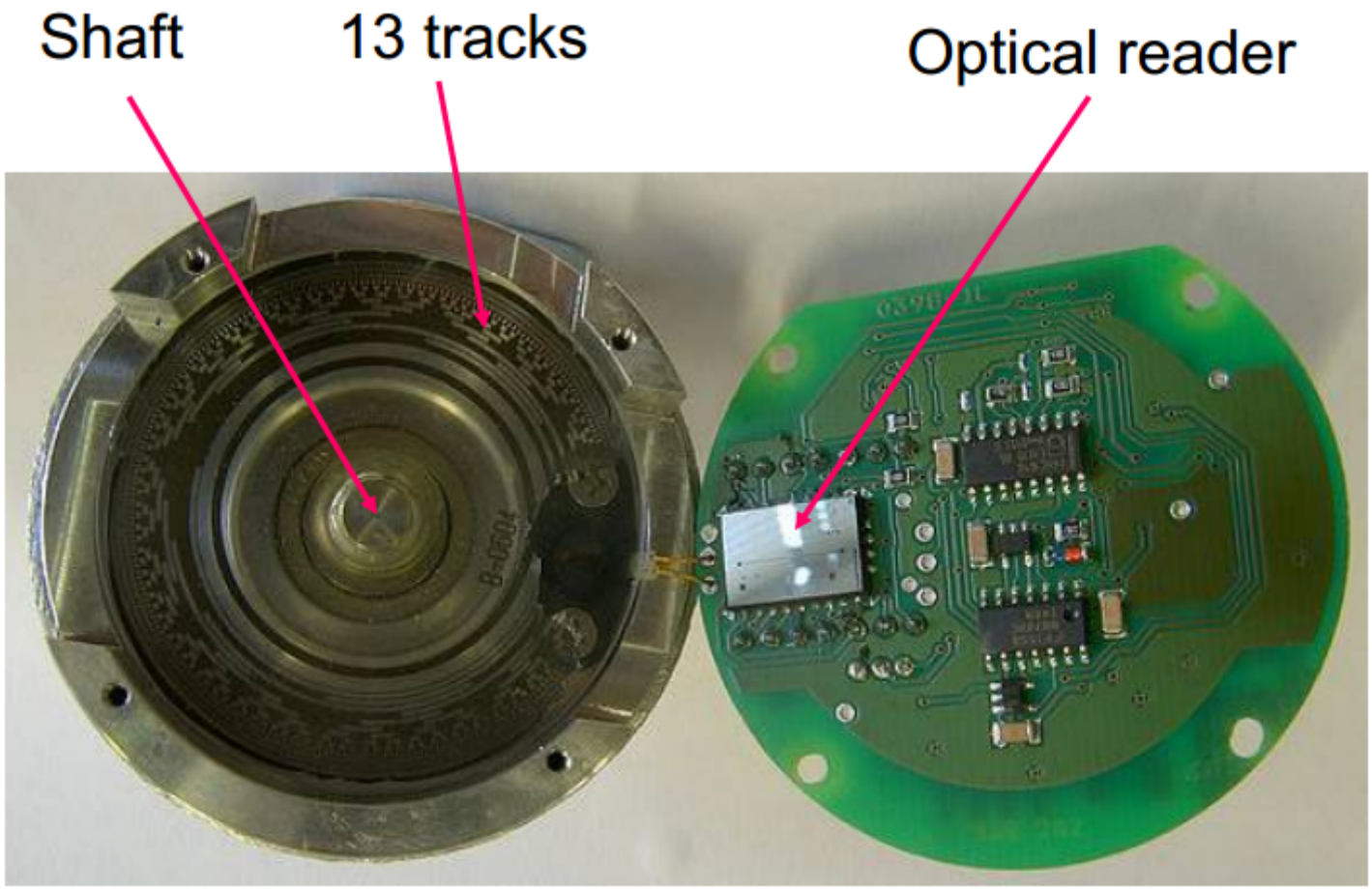
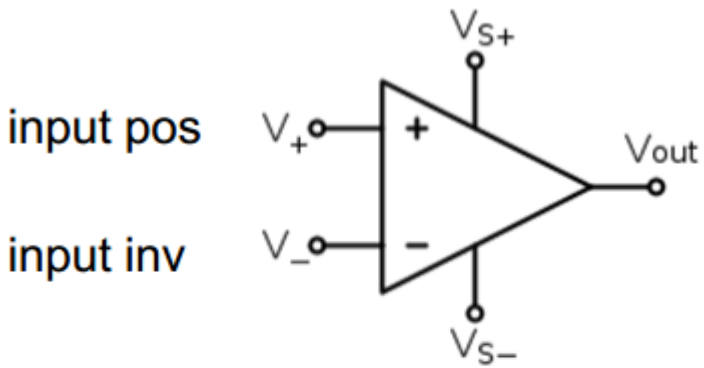
4	off	ON	off	135° - 180°
5	ON	ON	off	180° - 225°
6	ON	ON	ON	225° - 270°
7	ON	off	ON	270° - 315°
8	ON	off	off	315° - 360°

13 bit shaft Encoder



Sistem Kontrol Analog: Operational Amplifier



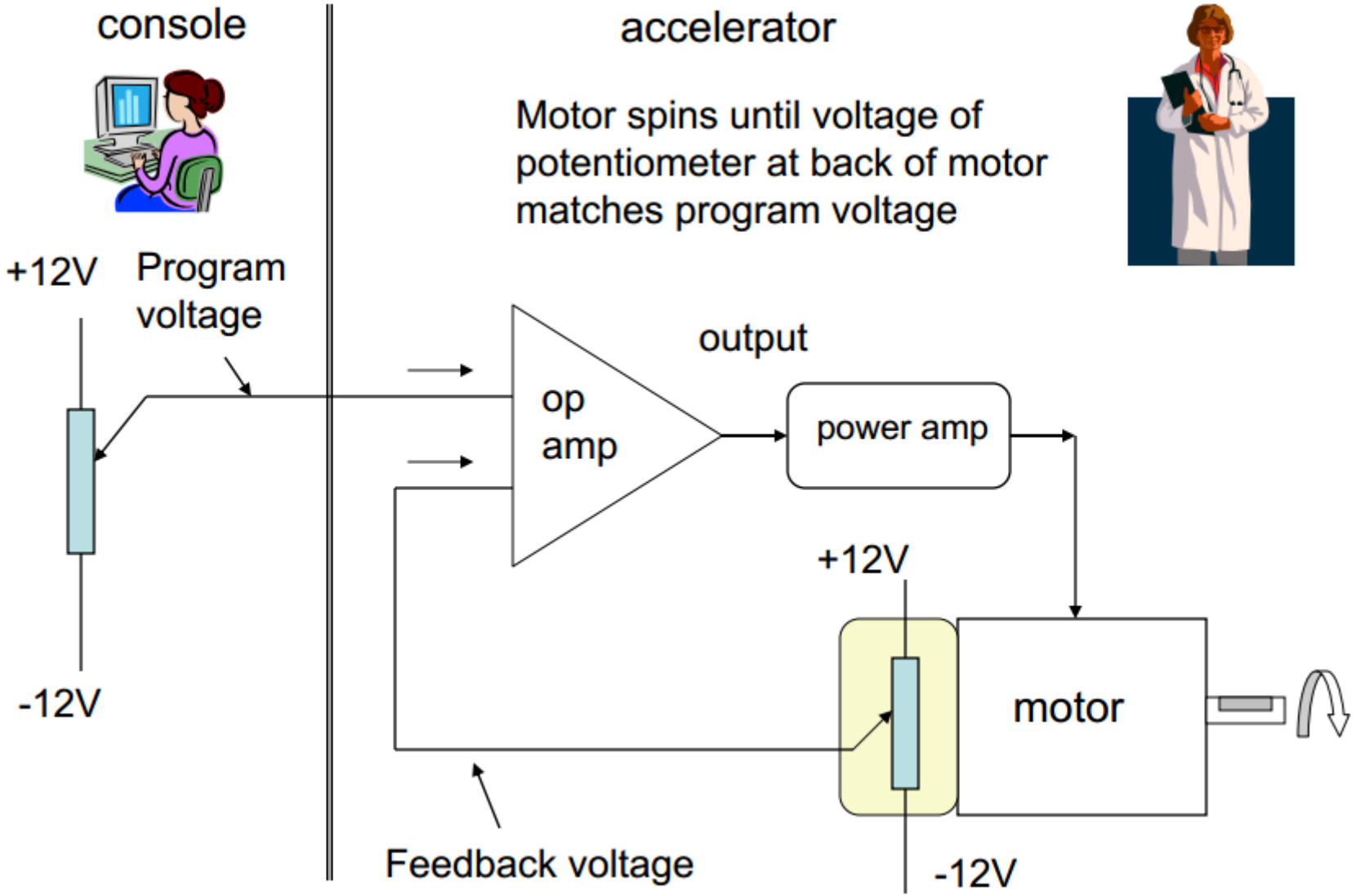
V_s+ , V_s- pos and neg power supply voltages

$Z_{in} = \infty$ $I_{in} = 0$ small input current

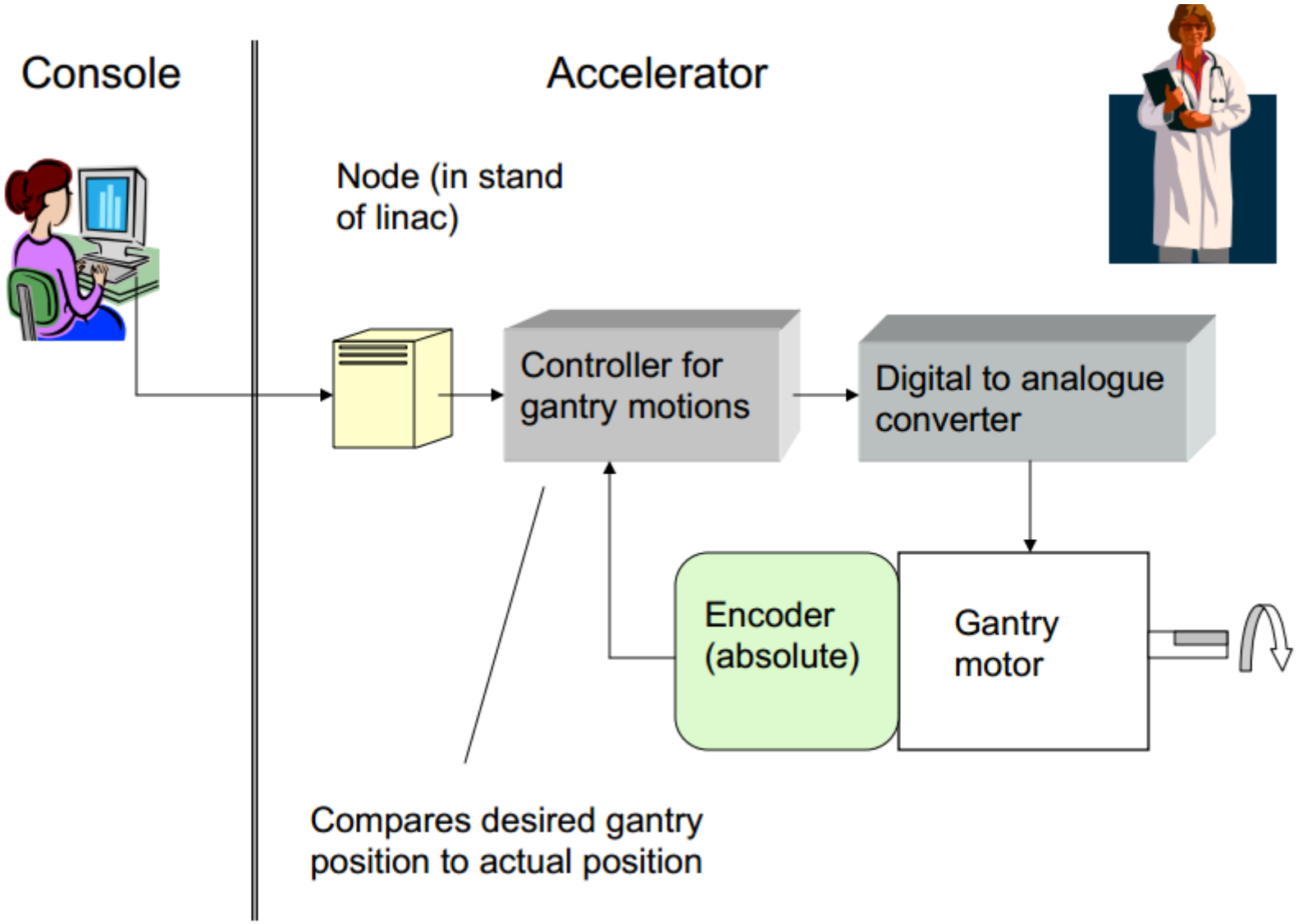
$Z_{out} = 0$ $I_{out} = \infty$ high output current

$\boldsymbol{V_{out} = (V_+ - V_-) \times A}$ high amplification $A \rightarrow \infty$

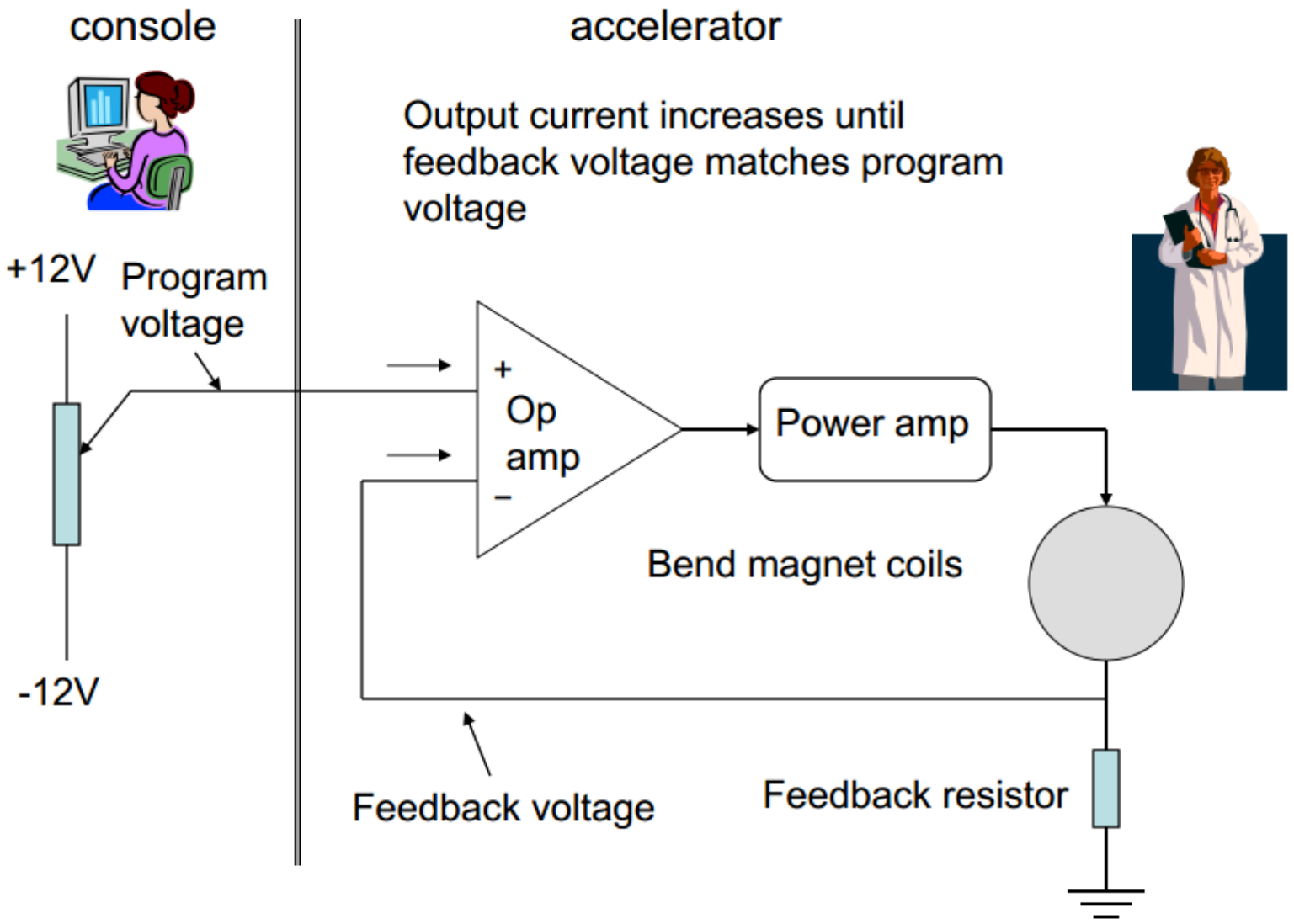
Sistem Kontrol Mekanik Analog



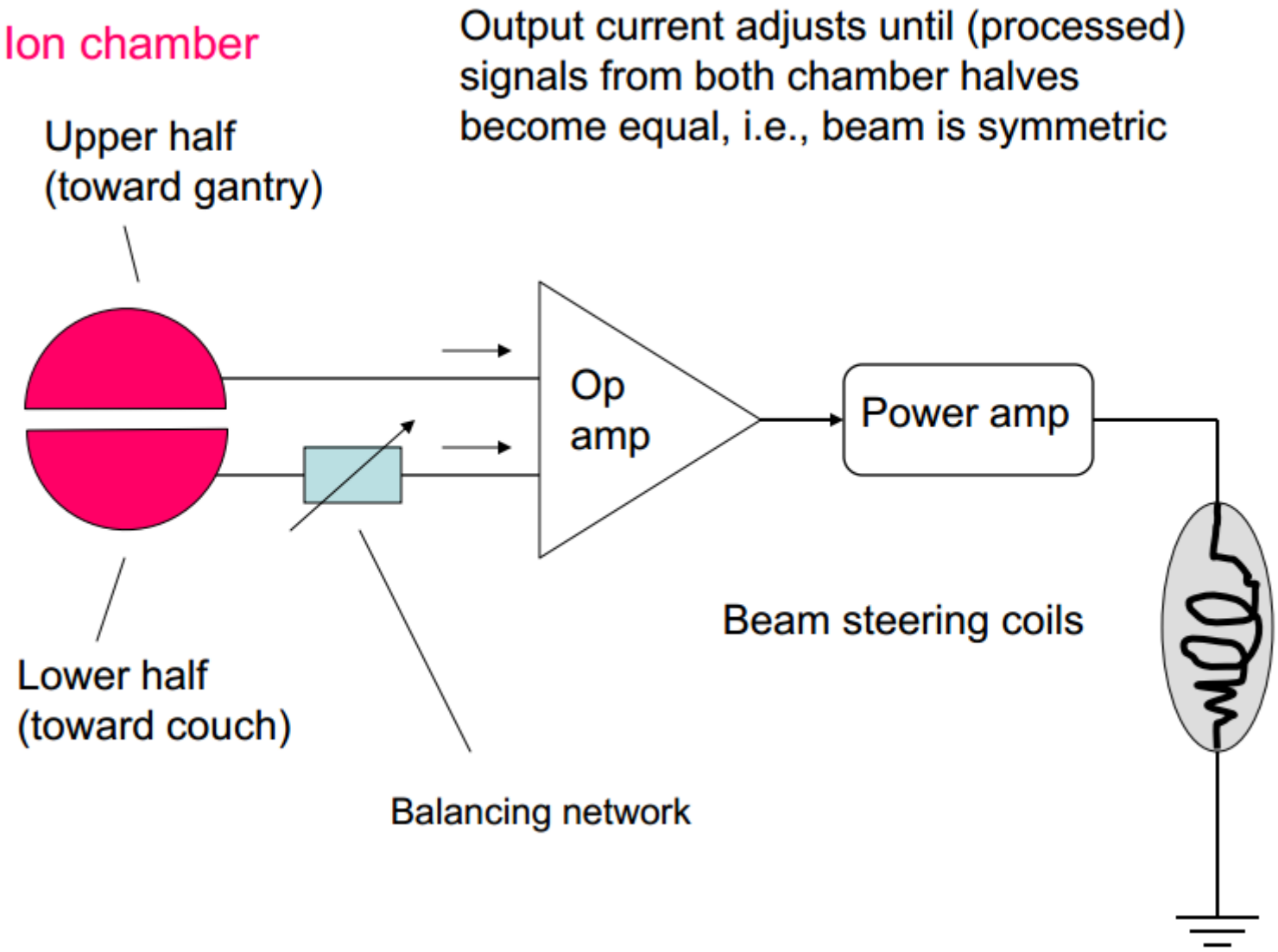
Sistem Kontrol Mekanik Digital



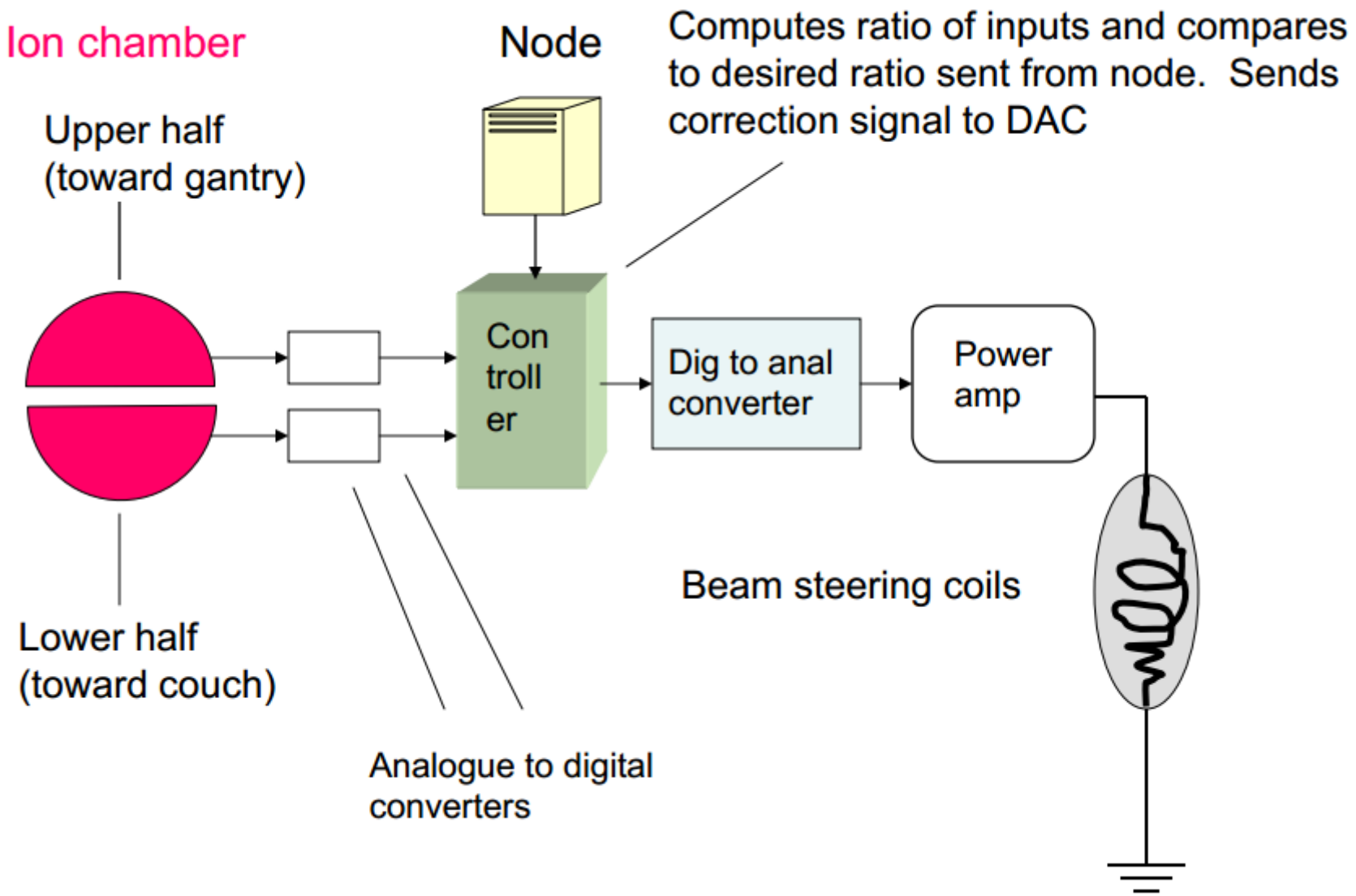
Sistem Kontrol Elektrik untuk Energi



Sistem Kontrol Elektrik Analog - beem Symmety



Sistem Kontrol Elektronik Digital – beem Symmetry



Arah Sistem Kontrol Digital

Diharapkan memiliki:

- ❑ Akurasi yang lebih baik
- ❑ Kepresisian yang meningkat
- ❑ Pengaturan Parameter lebih mudah
- ❑ Biaya maintenance lebih murah
- ❑ Mudah diintegrasikan dengan sistem lain
- ❑ Mampu melakukan tunning otomatis

Informasi

maulana.lecture.ub.ac.id