1. DR. JONATHAN VALVANO: Professor Yerraballi,
2. what are we going to learn today?
3. DR. RAMESH YERRABALLI: Today we're going to see how computers can take stimuli
4. from the external analog world and store them digitally in the computer.
5. So take an example.
6. Here's an example of a volume knob in a rotational form or as a slider.
7. What's essentially happening here is that the position
8. is a variable resistance.
9. So if we can convert this variable resistance to say,
10. voltages between some range, 0 to 3 volts, 3.3
11. volts, then we can take that voltage and store it
12. inside a computer as 12-bit number using an analog-to-digital converter.
13. DR. JONATHAN VALVANO: That means that any signal
14. that we can convert into a voltage could then
15. be entered into the computer with the A-to-D.
16. DR. RAMESH YERRABALLI: That is correct.
17. DR. JONATHAN VALVANO: Let me show you some examples.
18. The first is a strain gauge.
19. And it could be used to measure force or pressure.
20. DR. RAMESH YERRABALLI: Here's a thermostat
21. that can be used to measure temperature.
22. DR. JONATHAN VALVANO: Here's another temperature sensor.
23. It's an integrated circuit.
24. DR. RAMESH YERRABALLI: Here's a microphone that measures sound.
25. DR. JONATHAN VALVANO: Here's a digital camera.
26. It looks at the image and creates a two dimensional digital array
27. of what it sees.
28. DR. RAMESH YERRABALLI: Here is a GPS that
29. senses the coordinates of where you are, latitude and longitude (actually
30. the HMC6352 is a compass).
31. DR. JONATHAN VALVANO: Here's the infrared distance sensor
32. we're going to put in our robot.
33. And it measures distance.
34. DR. RAMESH YERRABALLI: Here's another distance sensor.
35. This is an ultrasonic distance sensor that gives you distance.
36. DR. JONATHAN VALVANO: Here is a catheter that measures biopotentials.
37. This ring right here is inside the heart.
38. And it allows the pacemaker to measure the biopotentials in your heart.
39. DR. RAMESH YERRABALLI: Yes, as a matter of fact,
40. the LaunchPad has internal sensors which sense temperature.
41. DR. JONATHAN VALVANO: So what are we going to build?
42. DR. RAMESH YERRABALLI: We're going to build a robot.
43. And the robot car we're going to build is will use infrared sensors.
44. This is different from our bump sensors, which
45. sensed an obstacle by actually colliding with it.
46. Now we can measure the distance from the obstacle,
47. and then we're going to take evasive action so
48. that we can avert bumping against obstacles.
49. DR. JONATHAN VALVANO: So this is a classic control system.
50. In other words, our objective is to drive
51. straight down the middle of the road.
52. And we're going to begin by sensing where we are.
53. To tell where we are relative to the middle of the road.
54. And then the software in the computer will then
55. adjust the power to the two motors in an attempt to drive fast and straight.
56. DR. RAMESH YERRABALLI: That is correct.
57. So let's build it.