CMSC 628: Introduction to Mobile Computing

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Today's lecture

- Demo on using the SensorManager and the LocationManager.
- More discussion on Sensors

Two types of sensors on the android platform

- Hardware sensors
  - Physical sensors present on the phone
  - Accelerometers, temperature, gyroscope
- Software sensors
  - Virtual sensors that are built on top of hardware sensors.
  - Orientation sensors --- accelerometer + gyroscope?

Sensor type exported by the Android framework

- Motion Sensors
  - Accelerometers, gravity, gyroscope, linear acceleration, rotation vector
- Position Sensors
  - Magnetic field sensors, orientation sensors, proxmity sensors
- Environmental Sensors
  - Ambient temperature, light, pressure, humidity, device temperature

Motion Sensors

`TYPE_ACCELEROMETER`	`SensorEvent.values[0]`	Acceleration force along the x axis (including gravity).	m/s^2
	`SensorEvent.values[1]`	Acceleration force along the y axis (including gravity).	
	`SensorEvent.values[2]`	Acceleration force along the z axis (including gravity).	
`TYPE_GRAVITY`	`SensorEvent.values[0]`	Force of gravity along the x axis.	m/s^2
	`SensorEvent.values[1]`	Force of gravity along the y axis.	
	`SensorEvent.values[2]`	Force of gravity along the z axis.	

Motion Sensors

TYPE_GYROSCOPE	SensorEvent.values[0]	Rate of rotation around the x axis.	rad/s
	SensorEvent.values[1]	Rate of rotation around the y axis.	
	SensorEvent.values[2]	Rate of rotation around the z axis.	
TYPE_LINEAR_ACCELERATION	SensorEvent.values[0]	Acceleration force along the x axis (excluding gravity).	m/s^2
	SensorEvent.values[1]	Acceleration force along the y axis (excluding gravity).	
	SensorEvent.values[2]	Acceleration force along the z axis (excluding gravity).	

Motion Sensors

`TYPE_ROTATION_VECTOR`	`SensorEvent.values[0]`	Rotation vector component along the x axis (x * sin(θ/2)).	Unitless
	`SensorEvent.values[1]`	Rotation vector component along the y axis (y * sin(θ/2)).	
	`SensorEvent.values[2]`	Rotation vector component along the z axis (z * sin(θ/2)).	
	`SensorEvent.values[3]`	Scalar component of the rotation vector ((cos(θ/2)).[1]	

Accelerometers

- Pros:
  - Cheap sensor (from an energy perspective)
  - Can be used for relative motion detection, posture etc.
  - Every device has this sensor

- Cons
  - Very noisy
  - Component of g- attached to the sensor

- Can apply filtering techniques to minimize noise in the accelerometer data

Accelerometers