New Air Quality Measurement Tools

GBUAPCD
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New air quality measurement tools
Sharp dust sensor

All images courtesy of Sharp electronics
Sharp dust sensor

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10ms pulse interval means 100 samples/second

$0.32ms = 320$ microseconds
Sharp dust sensor

All images courtesy of Sharp electronics
Sharp dust sensor
Sharp dust sensor

Sampling timing of output pulse

T=10ms
Pw=0.32ms

Light emission

I_{LED}

OFF
ON

Output pulse

0.28ms
Sampling

Dust density characteristics (Example)

Output voltage (V)

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8
Dust density (mg/m$^3$)

All images courtesy of Sharp electronics
Sharp dust sensor

- Sharp electronics GP2Y1010AU0F
- Optical air quality sensor
- Infrared emitting diode and photo-transistor
- Low current consumption 11mA typical
- Sensitivity .5V/0.1mg/m³
- $11.95 from Sparkfun electronics
- Requires some additional circuity and PWM to operate correctly (RC timing)
Raspberry Pi
Raspberry Pi

- Credit card-sized single board computer (ARMv7)
- Runs Linux and soon Windows 10
- USB keyboard and mouse
- Ethernet port and built in NIC
- 4 USB ports
- HDMI monitor output
- 40 programmable GPIO pins
- 1GB RAM, Quad core 900MHz processor
- Operating system programmed on microSD card
- Once set up, you can just make copies of the disc
- Cost: $35
Version 1.0
Version 2.0
Version 3.1
Features of the Platform

● Data stored automatically on attached SD storage. No special tools, cables, tablets needed to retrieve data or run the system!
● System time automatically updated via GPS
● System location known from GPS
● Automatic generation of data maps viewable in Google Earth
● Network connections via:
  – Ethernet
  – Wifi
  – 3G
  – Bluetooth
Features of the Platform (continued)

- SSH, VPN, and webservice hosting
- Firewall and intrusion detection system
- Ad-hoc wireless access point
- Built with 100% Open source software
- 100% Free!
# Platform parts list

<table>
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<tr>
<th>Name</th>
<th>Quantity</th>
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Applications for GBUAPCD

- Ability to measure air quality on a local scale (micro climate studies)
- IPET drone-based monitoring platform
- Personal air quality monitor
- Rapidly deployable network short term applications
- Strength in numbers!
IPET data (Salts)
IPET data (Salts)
IPET data (A-Tower)
IPET data (A-Tower)
Google Earth Output Data
Even smaller?

Micro Python
Python for microcontrollers
Questions?
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Thank you!