Raspberry Pi
For
Amateur Radio

Part 2
1. Decoding Data Modes

The Raspberry Pi can use the audio input from an external USB sound card to decode digital modes. In fact you can install the popular FLDigi software on the Pi to decode a wide array of data modes including RTTY, PSK and CW to name a few.

This is probably the first project I would recommend to people dipping their toes in the world of Pi, in fact you can even buy SD cards with Raspbian+FLDigi pre-installed from Mike Richards G4WNC. This is a great way to get started quickly.

Once you’re decoding signals on the Pi, you can take it up a notch and start spotting the received signals to the Reverse Beacon Network via the Internet. This is easily done within the FLDigi configuration.
N2SYA de K5RWG
I have noticed a few things, yes, you will probably see some of the sails. Then it will snarl... I don't know if this is a good idea.

N2SYA de K5RWG
esF a great job.

Ysu hamo e st
2. Remote Software Defined Radio (SDR)

That’s right, you can set up (probably) the cheapest SDR receiver using a Raspberry Pi, USB soundcard and a RTL Dongle (~£10). You can receive between 25MHz up to around 1800MHz using this dongle, not too shabby. Attach this to a discone antenna and you’ve got a very capable scanner!

You can run the popular SDR# (pronounced SDR Sharp) software under Raspbian to make this a reality.

What’s more, is that the Pi and dongle can be remotely located and accessed from the comfort of your desktop/laptop/tablet device in your home. You of course need to connect your Pi to your home network somehow, you have two choices here either using a WiFi (separate dongle needed) or via Ethernet cable. I would recommend the hardwired cable route if possible to minimise drop outs.

Once again Mike G4WNV sells pre-built SD Cards with everything you need to get started, just add a Raspberry Pi and an RTL dongle (who doesn’t have one knocking around the shack?).
3. WSPR Transmitter

The Pi is quite incredible in that you can press the GPIO pins into outputting RF between 0-250MHz. Suddenly we have a capable LF/MF/HF/VHF WSPR transmitter! The Raspberry Pi has a reference crystal on board which allows for this, although it will need to be calibrated within the WsprryPi software to ensure it’s precise enough for WSPR.

The Pi provides around 10mW of output, so not a massive amount of RF, but enough for the WSPR beaconing mode. One important note is that it outputs a square wave which necessitates a low pass filter. You will also want to use a regulated power supply with it to ensure
4. Amateur Satellite Tracking

This is probably the easiest Raspberry Pi project you can undertake. Install the GPredict software on your Raspberry Pi and you have a very capable satellite tracker, allowing you to track every conceivable satellite across the world in real time.

It allows you to filter the type of satellites you can track, this is where you can just select the amateur radio satellites you’re interested in working and see in real time which of the birds you can work through.

Of course the next step is to interface the Raspberry Pi with your antenna controller and start tracking the sats in real time, now there’s a thought!
5. Digital Voice (DV) Hotspot

Turning the Pi into a DV (Digital Voice) hotspot has proved to be another popular use of the Pi by amateurs. There are a number of dongles and add on boards which allows you to turn your Pi into an access point into the D-STAR, Fusion and DMR networks.

The Pi bridges the gap from RF to the internet, without you requiring any local repeaters that support DV to be in range.

There are currently two commercial add-ons that will add DV support to your Pi:

→ DVD4Mini USB Dongle

This is a great use for a cheap Pi computer, now you can join the digital voice revolution without waiting for your local repeater technology to catch up!
6. APRS I-Gate

You can turn the Raspberry Pi into an APRS (Automatic Packet Reporting System) Digipeater to track the positions of amateurs and indeed yourself. When you connect a HT to your Pi you can receive packets from the radio and send them onto the APRS-IS (internet based APRS network) and vice versa.

Good instructions for setting up a RX only APRS I-Gate can be found here.
Using the PiAware software you can now track real time ADS-B (Automatic Dependent Surveillance – Broadcast) flight tracking information from aircraft.

This allows you to track the aircraft in your area and track their progress in real time, pretty cool! I live not too far away from London Heathrow airport so there's always a lot of planes to track, which you can see in the screenshot here.

You will require an SDR dongle (cheap £10 RTL TV dongle will do) to receive these and a suitable antenna for the 1090 MHz signals.

See the PiAware setup instructions or for a more convenient option see Mike G4WNC pre-built SD cards.
8. Rotator Controller

This is not one I’ve tried, but some intrepid experimenters are using the Raspberry Pi to control their antenna rotators. Check out the PiRotator project.

9. Contest Logger

EI5DI has updated his contest logging software so it compiles on the Raspberry Pi. This is a Windows console (character based) program, but can run under Wine (compatibility layer to run Windows on Linux) and Exagear. This logging software is well respected by contesters.
10. Retro Gaming Machine

Ok, the last two aren’t amateur uses for the Raspberry Pi, but they do rank as many people’s favourite uses for this great little computer!

The Pi can be easily turned into a retro arcade machine to play all of the classic games from your youth.

The RetroPie project gives you everything you need to run games from a whole host of different gaming platforms. I’ve tested ZX Spectrum and SNES games and these run very well!

The Picade (£180) gives your Raspberry Pi a quality arcade cabinet complete with retro controls, this is super cool, but I can’t quite make the jump to spend £180 on it.
GPIO Pins

Now we get onto one of the main reasons the Raspberry Pi has been so widely adopted by hobbyists, the General Purpose Input Output Pins (GPIO). Depending on the version of Pi you get they will have anything from 26-40 GPIO pins onboard.

This is what gives us the physical interface between the Pi and the outside world, because it allows us to connect a very wide range of sensors/devices and breakout boards. These devices can collect information and can be controlled by software (which you can install or even write) on the Pi. Suddenly the potential for real world ham radio applications seems endless!

Pi HATs (Hardware Attached on Top) are specially designed bits of hardware which can be purchased and plugged straight into the GPIO pins. These are pre-assembled and are designed to be the same size as the Pi to make mounting easier.
- **CHIRP** - Programming software for a variety of Radios
  - `$ sudo apt-get install chirp`
- **WSJT-X 2.0** - Digital mode decoding software for FT8, JT65, JT9, WSPR, MSK144, etc. Please note anything with version 1 as of the end of 2018 is now obsolete.
  - Download: [HERE](http://www.physics.princeton.edu/pulsar/K1JT/WSJTX.html)
  - Website: [http://www.physics.princeton.edu/pulsar/K1JT/WSJTX.html](http://www.physics.princeton.edu/pulsar/K1JT/WSJTX.html)
- **FLdigi** - Universal digital decoder program, does most modes and is a nice compliment to WSJT-X
  - `$ sudo apt-get install fldigi flmsg flwrap`
  - Website: [http://www.w1hkj.com/](http://www.w1hkj.com/)
- **Gpredict** - Satellite Tracking Program
  - `$ sudo apt-get install gpredict`
  - Website: [https://sourceforge.net/projects/gpredict/](https://sourceforge.net/projects/gpredict/)
- **XLOG** - Logging Program for ham radio
  - `$ sudo apt-get install xlog`
  - Website: [http://xlog.nongnu.org/](http://xlog.nongnu.org/)
To get a list of current ham radio applications available for the Raspberry Pi you can visit here: http://raspberryconnect.com/raspbian-packages-list/item/71-raspbian-hamradio

You can also visit Add/Remove Programs to perform some of the installations.
Ham Radio Packages

To install Raspbian software on a Raspberry Pi

Packages are installed using Terminal. First get an updated package list by entering the following command in terminal if this has not been done today

sudo apt update

Then install your chosen package with the command

sudo apt install package-name

Find out more with the Guide to installing software with the apt command.

WWW: Please note: each listing has a www link to a related webpage, the links are supplied by the author. I can not guarantee they are all active and related to the listed package.

Distro Version: Buster(98) = Raspbian Buster, Stretch(9) = Raspbian Stretch, Buster & Stretch(98) = same version for both. If only one Distro is listed then the package is only available on that distribution.

Jump to section ABCDEFGHIJKLMNOPQRSTUVWXYZ

HAMRADIO

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aolfx Buster:(98)1011-17+b4 Stretch:(9)81011-17 Receive faxes using your radio and sound card
alde Buster & Stretch:(0.7.7-1) Morse code training program
ampr-ripd Buster:(2.4-1) Stretch:(1.15-1) Routing daemon for APRNnet gateway announcements www
antennavis Buster & Stretch:(0.3.1-4) antenna radiation pattern visualization software www
aprsdigi Buster & Stretch:(3.10.0-2) digipeater for APRS www
aprx Buster:(2.9.0+dtsg-2) Stretch:(2.9.0+dtsg-1) APRS Digipeater and iGate www

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- apt-get commands

- apt-get update
- apt-get install [package name]
- apt-get remove [package name]
- apt-get clean (Erase old downloaded archive files)

The user pi has sudo privileges. Root access.

**sudo apt-get update** therefore updates the installed software.
Thank you

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Questions?