The use of Software Defined Radios (SDR) in ground-station design.
(Student's researches that deal with space engineering)

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The use of Software Defined Radio (SDR) in key areas of technology has become pervasive in recent times. From civilian to military and from class rooms to industry, SDR has found numerous applications. These days setting up a private base station or hacking ones call traffic is not uncommon. SDRs come in various flavors and ranges which are dictated by their complexity and price. Some examples of SDRs are, Funcube dongle, USRP, etc.

Another important limb on which software defined communication rest, is a versatile digital signal process backend which can properly drive the hardware. There are several types of DSP engines available today which range from proprietary to open-source. Some of which include Matlab, Labview and Gnuradio. Trends in technology suggest that open-source based solutions are more dynamic and efficient than their closed-source or proprietary alternatives. Gnuradio and Ettus USRP are some examples of these solutions.

Gnuradio is a linux based open-source, DSP engine designed by Tom Rondeau and Ettus USRP (Universal Software Radio Peripheral) is also an open-source SDR hardware radio designed by Matt Ettus . These two combined gives one command over the airwaves. Solutions such as openbts and the like have been developed using only these two resources. The USRP can be used to couple the radio spectrum into the digital world while the Gnuradio can be used to manipulate the spectrum in the digital domain. Armed with transmit and receive capabilities, the possibilities are endless to the radio operator.

In Satellite communication, one of the most important elements is the sensitivity of the earth station. A very sensitive ground station implies a higher quality of communication between the satellite and the earth station and therefore, a more productive mission. Given the challenges of designing and installation a sensitive “analogue” ground-station, one is tempted to look for alternatives that can perform similar or better functions. This is where the SDR comes in handy, by providing a portable,cheap and highly flexible solution to ground-station requirement.

SDR exponentially simplifies ground station designs and improves the sensitivity of the ground station. This rare quality is borne by the amazing flexibility that both the hardware and software of the SDR provides. With the Gnuradio, one can easily design and implement solutions that would otherwise cost hundreds of thousands of dollars in purchasing equivalent hardware.

In conclusion, SDR has unlocked the vault of hidden treasures that once laid buried in the radio spectrum.