Ti mmWave Sensor finding

Referencing a Radar design using their sensor and evaluation board: <http://www.ti.com/lit/ug/tidud36b/tidud36b.pdf>

* Frequency-modulated continuous-wave (FMCW) radar: mmWave Ti radar is this type of radar. Description of some of the knowledge about this radar will be explained later in the document.
* Why Radar?
  + FMCW radar are accurate measurement of distances and relative velocities of obstacles and other vehicles
  + Advantage over camera and LIDAR: immune to environmental conditions (such as the effects of rain, dust, and smoke)
  + Advantage over ultrasonic: radars typically have a much longer range and much faster time of transit for their signals
    - Radar uses electromagnetic wave with travels at the speed of light
    - Ultrasonic uses sound wave with travels at the speed of sound.
* Radar (at least mmWave FMCW radar) needs antenna to send and receive signal

Referencing the Ti mmWave Series training:

<https://training.ti.com/intro-mmwave-sensing-fmcw-radars-module-1-range-estimation?cu=1128486>

* Radar have RX and TX antenna, TX is for sending the wave and RX is for receiving the wave
* The range is programmable ( so maximum range can be changed)
* Radar signal is called Chirp, chirp is a sine function(wave) with frequency increase over time until the maximum value. The difference between the max frequency and the start frequency is called the bandwidth (B). The time it takes to increase the frequency from starting frequency to max frequency is called ramp time (if correct). The Slope (S) is the rate of change of frequency over time.
* The bandwidth affects the resolution of the radar.
  + Greater bandwidth better resolution
* It is possible to program details about the chirp itself, therefor program the radar to have different ranges and resolution. By customize the chirp and more, we can customize an radar for our application.

Ultrasonic Sensors

<https://www.maxbotix.com/Arduino-Ultrasonic-Sensors-085/#coding-1>

<https://www.maxbotix.com/Ultrasonic_Sensors/MB7051.htm>

<http://www.ti.com/tool/TIDA-00151#technicaldocuments>

<https://www.monnit.com/Product/MNS2-9-W2-US-ST>

Type of sensors

<https://www.keyence.com/ss/products/sensor/sensorbasics/proximity/classification/>

<http://lidarradar.com/info/advantages-and-disadvantages-of-radar-systems>

<https://www.electronicdesign.com/automotive/how-will-radar-sensor-technology-shape-cars-future>

Bluetooth vs Wifi

<https://www.diffen.com/difference/Bluetooth_vs_Wifi>

Connection

<https://aic.gov.au/publications/tandi/tandi329>

<https://developer.android.com/guide/topics/connectivity/nfc/>

Ti radar:

<http://www.ti.com/lit/ds/swrs203a/swrs203a.pdf>

Sick Sensors:

<https://cdn.sick.com/media/docs/1/91/691/Operating_instructions_UM30_21_118_de_en_IM0030691.PDF>

<https://cdn.sick.com/media/docs/9/19/519/Operating_instructions_UC30_21_162_UC30_21_164_de_en_IM0057519.PDF>

<https://www.sick.com/us/en/distance-sensors/ultrasonic-sensors/c/g185671?q=%3ADef_Type%3AProductFamily%3Aft672289GRENZREICHWEITE%3C%40%3EMaximum+range~~mm%3A8000-8000.0>

<https://www.sick.com/us/en/downloads/software?q=:Def_Type:Download:productfamily:UC30:productfamilygroup:Ultrasonic%20sensors&page=1>

Omron Sensors:

<http://www.ia.omron.com/products/family/1467/specification.html>

Rockwell Sensors:

<http://literature.rockwellautomation.com/idc/groups/literature/documents/in/873p-in005_-en-p.pdf>

<https://ab.rockwellautomation.com/Sensors-Switches/Ultrasonic-Sensors/Analog-or-Discrete-Output-Ultrasonic-Sensors#specifications>