SimHumalator

A Human Radar Simulator

1. **Working Principle of PWR Simulator- We refer users to [PDF] of the paper**
2. **Simulator simulate human radar returns as a function of following parameters-**
    a. **Radar Parameters**
        i. Radar Waveform Parameters
            1. Bandwidth (Hz)
            2. Pulse Repetition Frequency (PRF)
            3. Number of Fast Time Samples
            4. Coherent Processing Interval (CPI)
        ii. Configuration of Radar
            1. Monostatic
            2. Bistatic Inline
            3. Bistatic Circular
        iii. **Target Parameters**
            1. Activity type
            2. File Number (Multiple files within each activity
            3. Aspect angle of target with respect to radar
            4. Initial location of target in space
        iv. **Radar Signatures Generated**
            1. Baseband digitized radar returns
            2. Range-Doppler Maps
            3. Doppler-time Profiles

3. **Demonstration of the simulation**
    a. **Run the app. The main page of the simulator would be**

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Select PWR System Parameters | Select Target Parameters | Generate PWR Signatures

PWR System Description | Choose PWR System Parameters

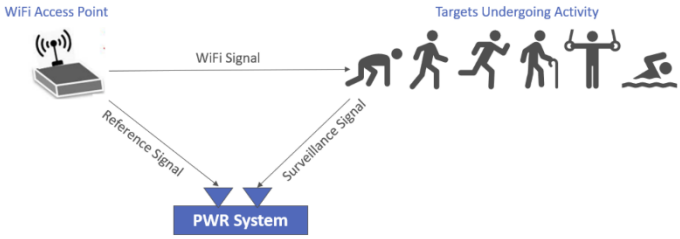
This tool can simulate human returns in passive WiFi radar (PWR) settings as a function of following parameters-

1. Radar Parameters
   # Pulse Repetition Frequency (PRF)
   # Coherent Processing Interval (CPI)
   # Number of fast time samples

2. Target Parameters
   # Activity type
   # Aspect Angle wrt radar
   # Initial radial distance from radar

3. Radar Signal Processing
   # Generate cross ambiguity functions (CAFs)
   # Doppler-time Profiles

4. Save Files
   # CAFs
   # Doppler-time Profiles



Next

b. Press Next to select PWR radar parameter. Some tabs are reserved for future extension of the simulator.

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Select PWR System Parameters | Select Target Parameters | Generate PWR Signatures

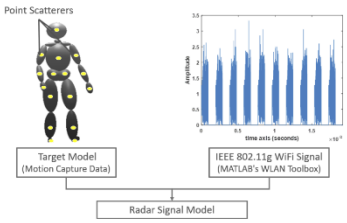
PWR System Description | Choose PWR System Parameters

Select PWR Parameters

IEEE Standard

(•) 802.11g ( ) 802.11n ( ) 802.11ad
Preserved for future releases

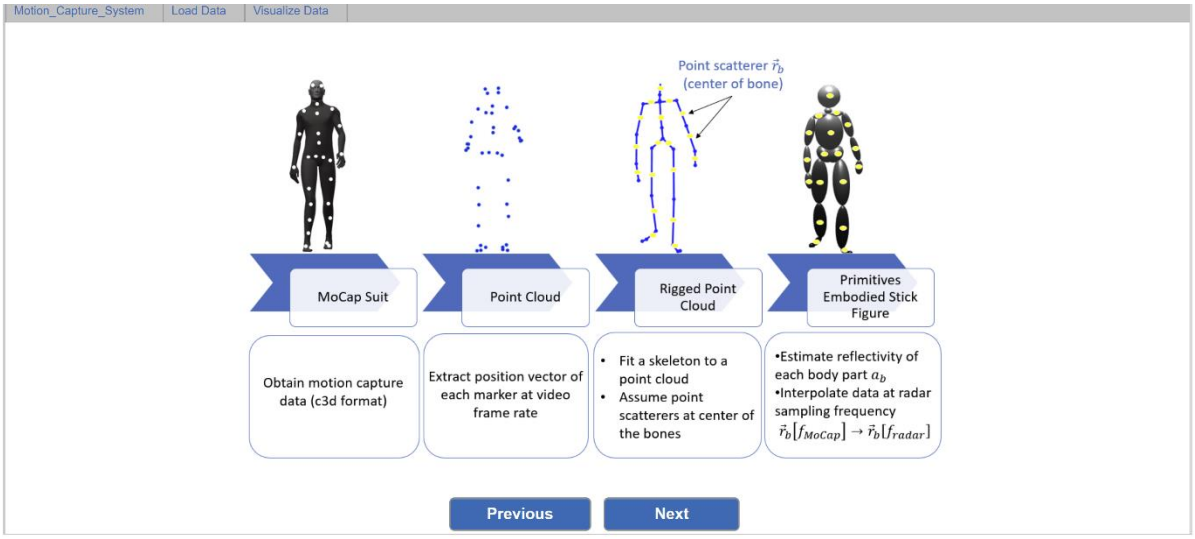
Modulation Scheme	(•) OFDM ( ) DSSS Default: OFDM	OFDM: Orthogonal Frequency Division Multiplexing DSSS: Direct-Sequence Spread Spectrum
Bandwidth (Hz)	(•) 20MHz ( ) 10MHz ( ) 5MHz Default: 20MHz	Decides range resolution
PRF (Hz)	500 Default: 500Hz	Pulse repetition frequency PRF (Must be greater than max Doppler frequency user wants to see)
CPI (sec)	0.2 Default: 0.2 sec	(Coherent Processing Interval CPI)
Fast time samples	500 Default: 500	(Decide number of fast time samples)



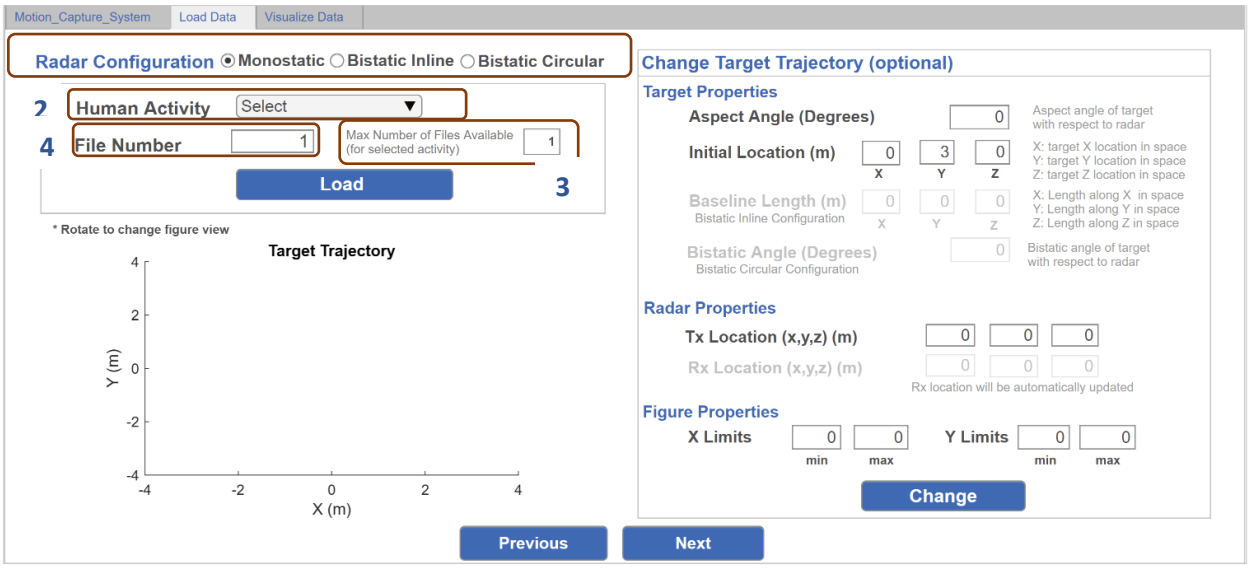
Previous Next

c. **Enter other parameters such as PRF, CPI, Bandwidth and number of fast time samples required for match-filtering. If not entered, will select the default values.**

d. **Press Next to enter target parameter selection tab. This tab shows the simulation methodology to generate target data based on motion capture system**

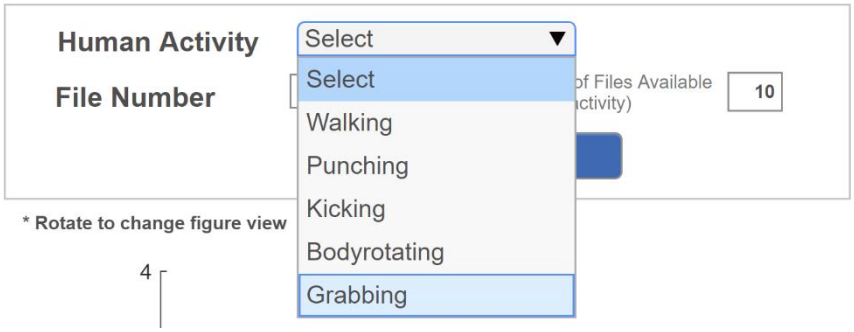


e. **Press Next to load target data**



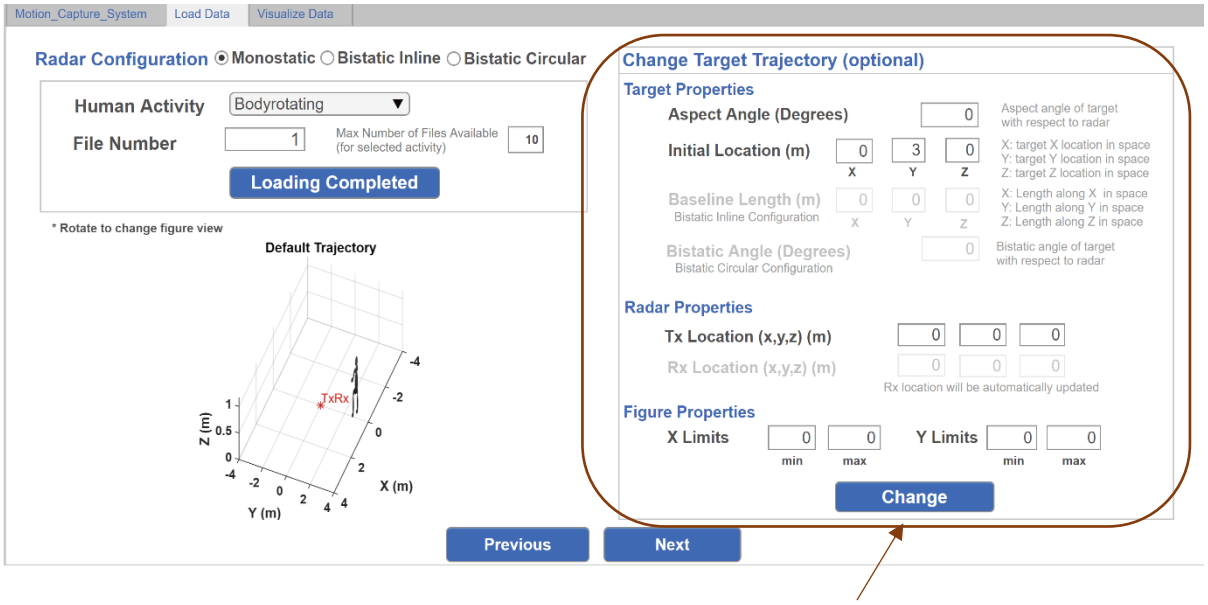
i. **First select the desired radar configuration**

ii. **Select the desired activity from the drop-down menu**



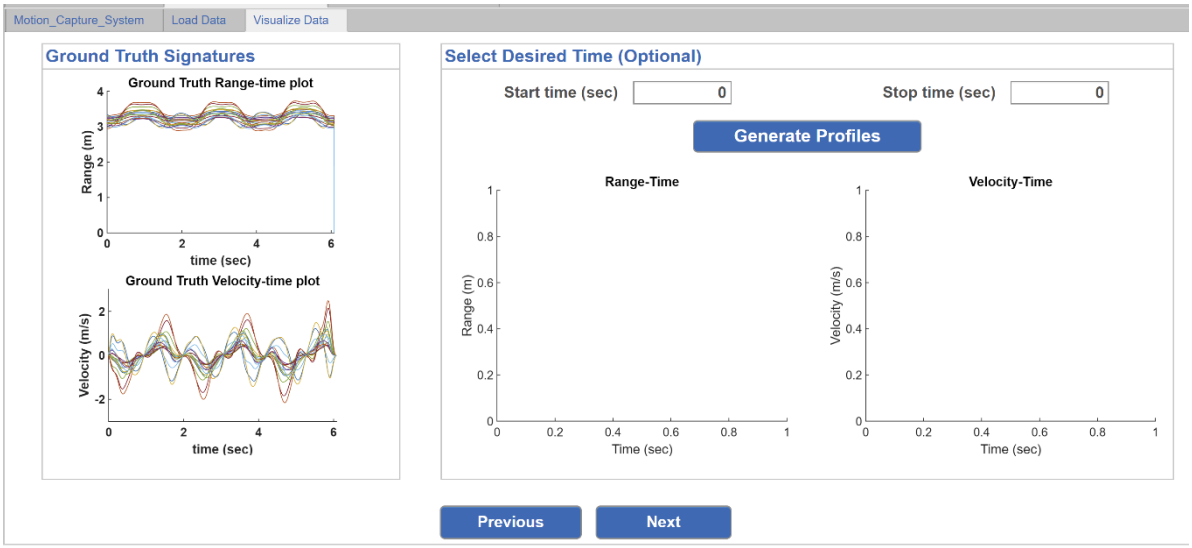
iii. **Once the activity is selected, the box marked red in 3 will display the number of files available in each activity category. For instance, Human body rotating has 10 files. User can enter the file number to generate data corresponding to a file.**

iv. **Once file number is entered, hit the load button. Figure on the bottom will display the human position in space with respect to radar**

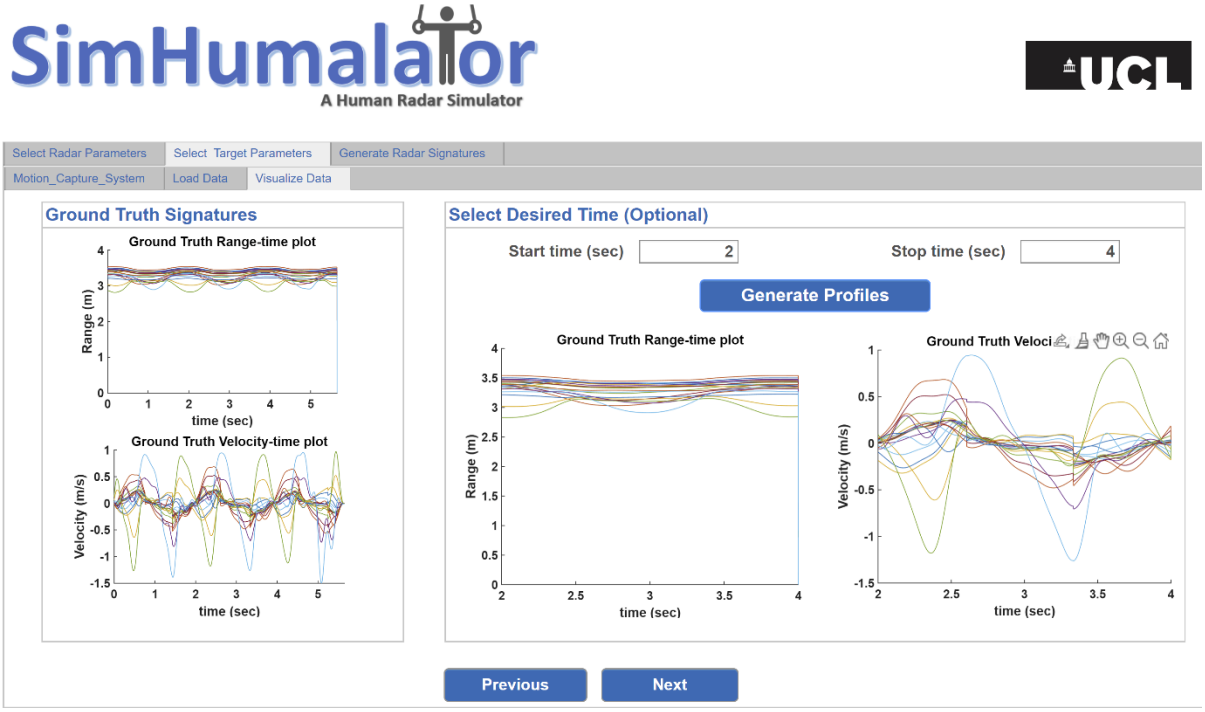


v. **Change the target trajectory parameters from the panel on the right-hand side and press change button. Once changes are fixed, press Next button.**

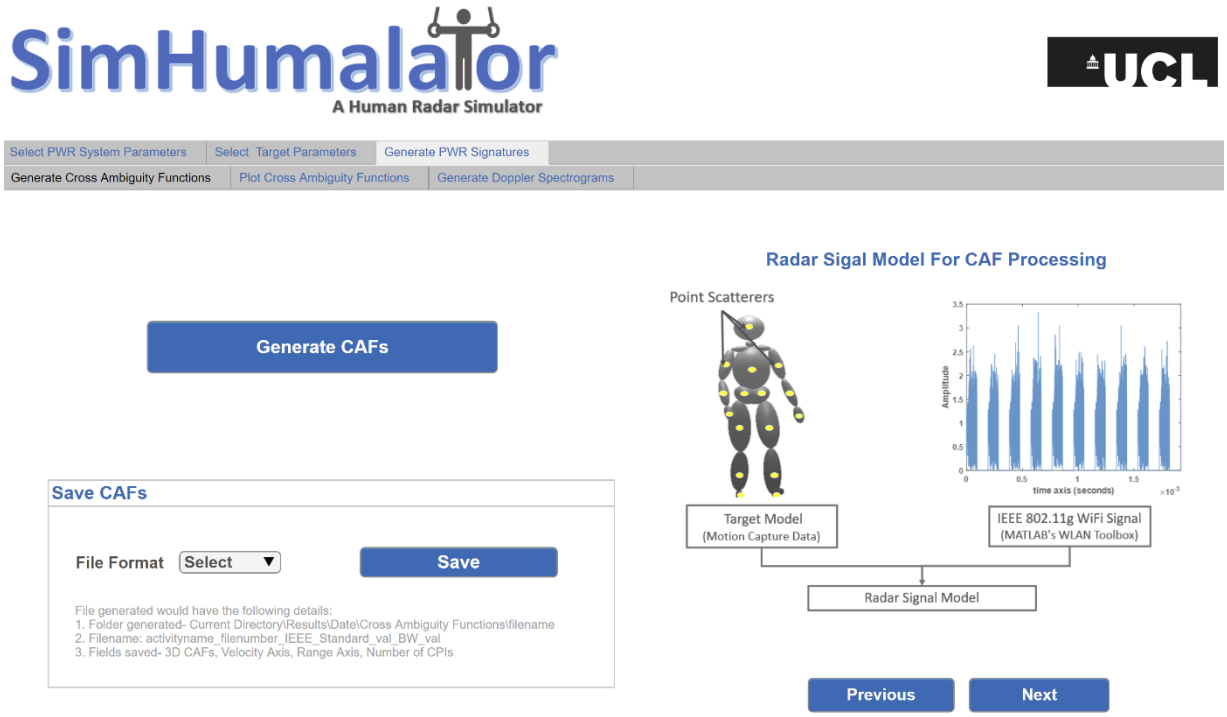
f. **Next page displays the ground truth signatures of the target- range-time and velocity-time.**



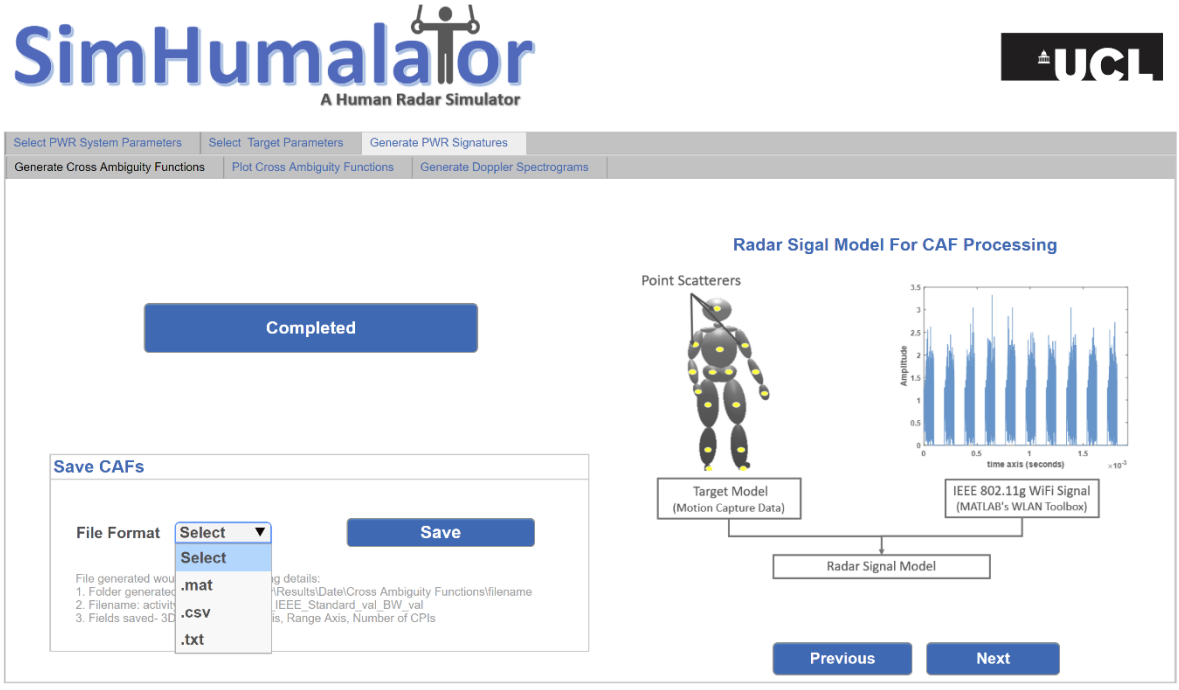
g. **If want to capture the entire data, then directly press Next button otherwise first enter the start time and the stop time to select the desired duration then, press Generate Profiles button. Once desired time duration is selected, press Next button.**



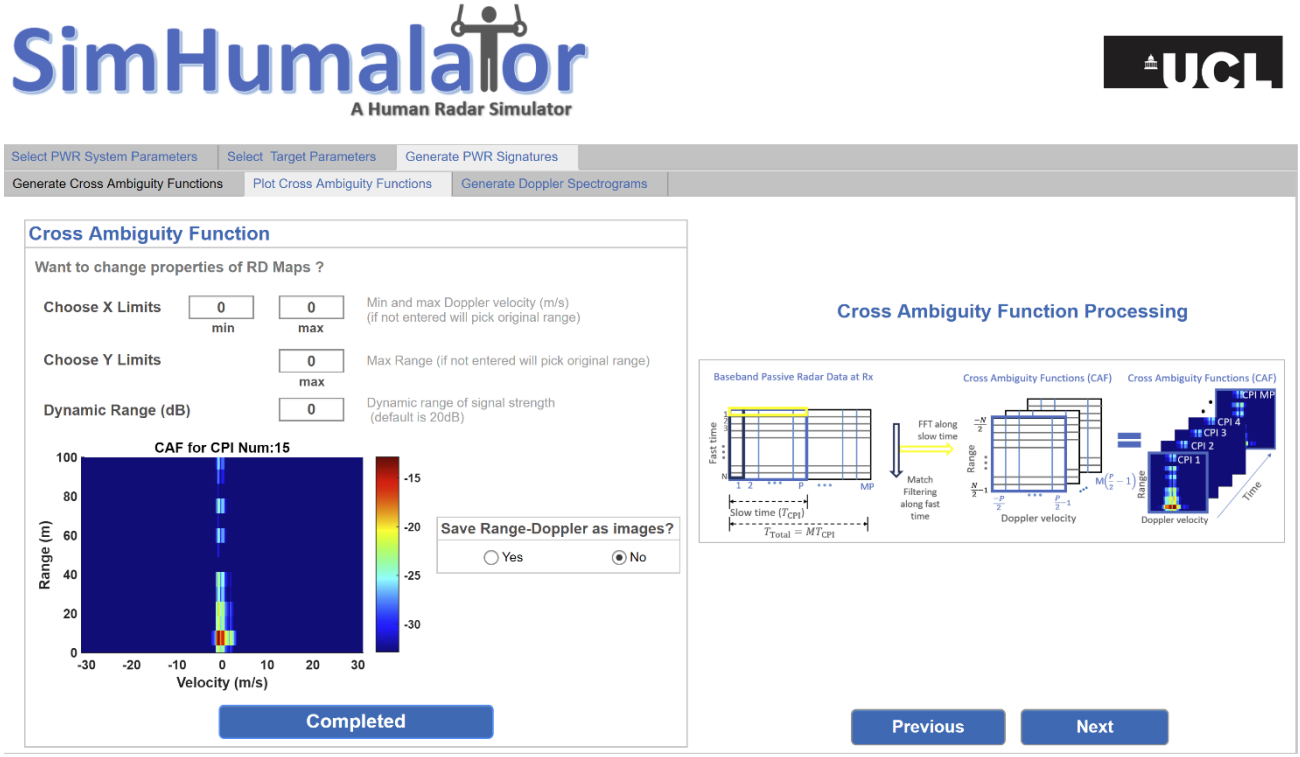
h. **This page belongs to radar signatures tab. Press Generate CAFs to generate the radar cross ambiguity functions (CAFs) from dynamic human activity for a selected configuration of radar**



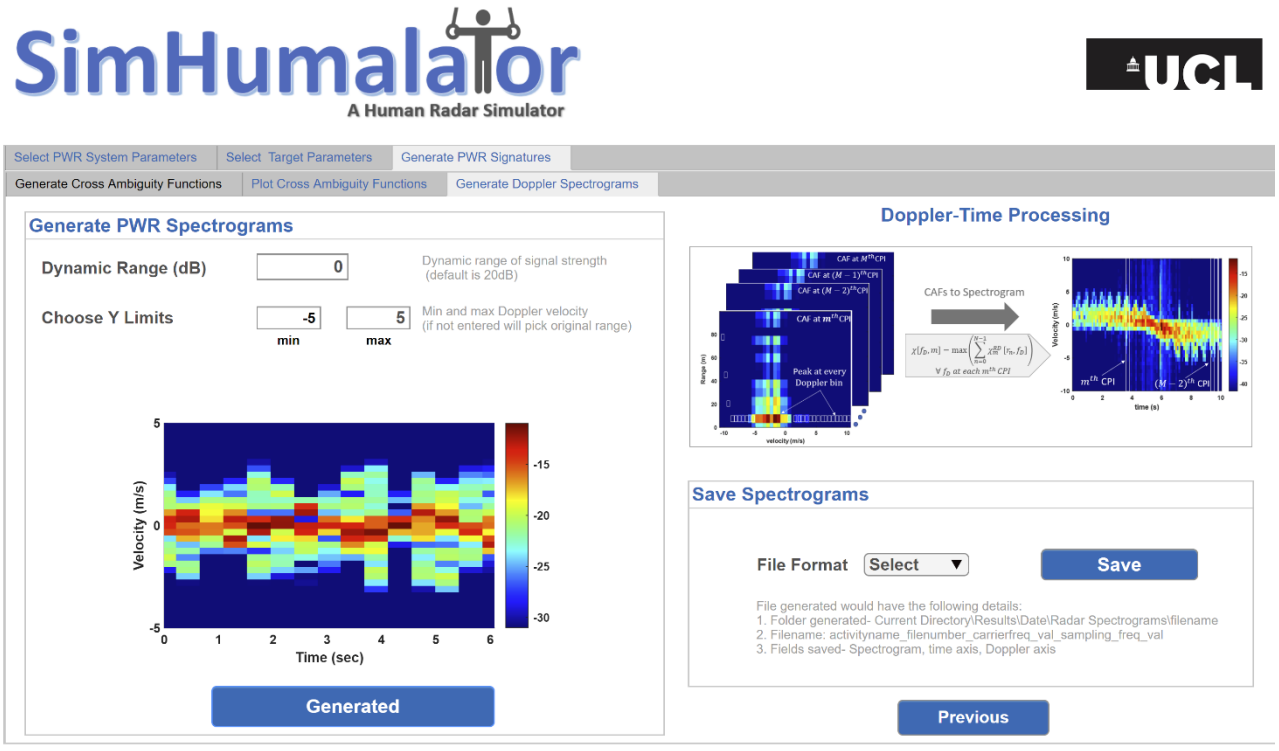
i. **Once generated, select the file format for saving the 3D CAFs**



j. **Press Next to view and save the CAFs in PNG format.**



k. Next page will generate the Doppler-time plots. Please note that if the values are not entered, default values will be picked up for the dynamic range, axis. Users can change these values.



4. Saved Files

Please note that the files will be saved in the current directory of the simulator. Folders would be generated independently for each signature type- Cross ambiguity functions and radar spectrograms. Withing each of these folders, another folder would be generated corresponding to the selected target activity and the file number corresponding to the selected activity. Detailed description of file being saved is given below the save button.