DARPA Spectrum Collaboration Challenge (SC2) Dataset collected from Scrimmages 4 and 5

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About the Database

This database contains the logged data from simulated scrimmage runs over a collaborative intelligent radio network in the DARPA Colosseum RF emulator for Spectrum challenge 2. As a competitor in DARPA SC2, in every match that we participated in during the last two scrimmages preceding the final event - namely Scrimmages 4 and 5 -, we constantly collected data from the 10 nodes in our Collaborative Intelligent Radio Network (CIRN). These scrimmage runs simulated a variety of real life scenarios. Following are a list of scenarios present in the scrimmages:

1. Alleys of Austin,
2. Passive Incumbent,
3. A Slice of Life,
4. Payline,
5. Jammers,
6. Wildfire,
7. Trash Compactor,
8. Nowhere to Run Baby,
9. Active Incumbent,
10. Temperature Rising,
11. -50dBFS Test,
12. -70dBFS Test,
13. -90dBFS Test,
14. SCE Qualification

Description of the Files

Under each scrimmage, there is a folder containing the scrimmage data. Inside that folder, subfolders represent data collected for each team, and for each team there are a number of matches. Each match takes place in a specific environment, and the log for these matches are contained in a sqlite database file called full.db. These full.db files contain data from different software radio nodes. From the 53 tables present in a full.db file, only 16 columns from 4 tables are used for analysis. These are consolidated in a separate small database, where there is a single pickle file for the whole scrimmage.

Description of full.db

Each full.db contains 53 tables,r ecording all the information we collect from 10 nodes throughout a match. Data from only 6 tables are used in the frame error prediction analysis. Following is a description of these tables:

0.1 Tables that contain data for frame error detection

0.1.1 Frame

The Frame table contains a frame sequence number, the source of that frame, the destination of the frame, and the following data:

1. ID of the specific channel used (information about channel frequency and modulation)
2. Send and Receive time
3. No of transmitted samples, blocks and symbol sequence ID
4. Receiver Gain
5. Information about the time spread

0.1.2 FrameRx

The FrameRx table contains a unique frame ID, whether the frame transmission was successful or not , and the following data:

1. SNR during frame transmission, and PSD of the received frame
2. Receive time
3. Noise variance

0.1.3 MCSDecisionEvent

The MCSDecisionEvent table a MCS update ID and the following data:

1. Modulation and Coding Scheme (MCS) of the transmission
2. Noise variance
3. Source and transmission node
4. Symbol sequence ID
5. Receive time and information about the time spread

The keying combinations are BPSK, QPSK, and 5 variants of QAM. Then there is different code rates possible for each case, resulting in a total of 52 possible combinations for the MCS.

0.1.4 PSDUpdateEvent

The PSDUpdateEvent table contains a PSD update ID ID and the following data:

1. The PSD
2. Source node
3. Symbol sequence ID
4. Time of PSD measurement, receive time and information about the time spread

The PSD value is contained in a 4096 byte CIL message.

0.1.5 ChannelAlloc

The ChannelAlloc table contains a channel allocation ID and the following data:

1. A 29 byte encoded message active channel allocations
2. The ID for OFDM parameter update event
3. Source node
4. Receive time and information about the time spread

The channel value is contained in a 29 byte CIL message.

0.1.6 ChannelAllocUpdate

The ChannelAllocUpdate table contains a channel allocation update ID and the following data:

1. A 14 byte encoded message about the channel allocation update
2. The ID for OFDM parameter update event
3. Source node
4. Receive time and information about the time spread

0.2 Other Tables

1. AchievedIMsUpdate
2. lowTrackerStateUpdateEvent
3. BlockRx
4. BuildInfo
5. FrameDetect
6. BurstSendEvent
7. C2APIEvent
8. GPSEvent
9. CCPacketEvent
10. IncumbentAttenuationUpdateEvent
11. InvalidFrameHeader
12. ChannelEstimationEvent
13. MandatedOutcomeUpdate
14. CoDelDelay
15. CoDelState
16. ModulationEvent
17. CollabCILRx
18. NetworkMap
19. CollabCILTx
20. NewFlow

21. CollabConnectionAttempt
22. CollabError
23. ReceivedARQFeedbackEvent
24. CollabPeerEvent
25. RouteDecision
26. CollabServerRx
27. RoutingTableUpdate
28. CollabServerTx
29. ScenarioInfo
30. CollabStateChange
31. ScheduleUpdate
32. ColosseumRate
33. Segment
34. DecisionEngineStep
35. SegmentRx
36. Doomsday
37. Start
38. EnvironmentUpdateEvent
39. SynchronizationEvent
40. FlowQueuePop
41. Text
42. FlowQueuePush
43. UHDAsyncEvent
44. FlowQueueResendEvent
45. UHDMsgEvent
46. FlowTrackerIMEvent
47. Waveform

The consolidated small database

This database is present as a single pickle file for a single scrimmage, incorporating all teams and matches. Inside the file, data for each specific edge is present in a separate block. A block contains two separate lists. The first list contains data about whether the transmission for a frame was successful or not.

The second list contains the following data for each frame:

1. SNR
2. Modulation Coding Scheme
3. Center Frequency
4. Bandwidth
5. PSD

The data is not normalized. Scrimmage 4 contains 35 matches while Scrimmage 5 contains 100 matches in total.

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