Database development concepts – Magnetized Dusty Plasma eXperiment (MDPX)
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For the MDPX project, we anticipate operating as a multi-user facility. In this mode of operation, we anticipate having users from Auburn University as well as US and international partners. We believe that this will necessitate the development of a robust database in order to properly track the experimental measurements that are taken by the users.

As with most other "dusty plasma" experiments, we anticipate that the vast majority of our experimental data will consist of three major types:

a) "Experimental state" data – this will typically be time-series data of a particular parameter (e.g., temperature at a point in the device, a voltage setting of a piece of electronics, etc.). This is "slow" data – usually acquired at rates of 1 to 5 points per minute, but recorded continuously – 24 hours / day.
b) "Research" data – this will typically be time-series data recorded by a probing device to reveal information about the plasma. This data may be recorded up to 10's of kHz for durations of up to 30 seconds at a time.
c) "Video" data – this will typically be a time-sequence of images recorded at up to 1000 frames/sec for up to 30 seconds at a time. The video data and the research data will usually be synchronized to each other.

For the approach we will take for the MDPX database, consider the following example. We wish to perform a series of measurements on the device by varying two parameters. Say Parameter 1 = input power, Parameter 2 = pressure. The experiment will be performed by fixing pressure and performing measurements over a range of input powers. We will then change the pressure to a new value and repeat the input power scan.

For each configuration of the experiment, we will record 10 seconds of simultaneous video and research data. In this manner, we envision that a single "record" in our database would contain video image and raw data files from probes. The record would also have certain metadata (e.g., time, date, set point values for Parameter 1 and Parameter 2, etc.) that would allow us – at a future time to search the data.

In particular, what would be of particular value would be to imagine "re-sorting" the aforementioned experimental data (the input power / pressure scan) so that a researcher could examine data at a fixed input power setting but over a range of pressures.

| Experiment metadata | Experiment metadata |
|---|---|
| User:          Date: | User:          Date: |
| Operator:      Time: | Operator:      Time: |
| Parameter 1: Set  Measure | Parameter 1: Set  Measure |
| Parameter 2: Set  Measure | Parameter 2: Set  Measure |

Video data

Video data

Research data

Research data

Exp: yyyymmdd:0001

Exp: yyyymmdd:0002

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