SSAM

File Format Specification

Version 1.04

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Revision History

Version	Date	Description
1.0	07/02/2004	Initial definition of the trajectory format.
1.01	07/19/2004	Corrected minor typos and formatting
1.02	07/20/2004	Changed scale and vehicle xy's to Float from Double
1.03	07/22/2004	Changed order to specifies units and scale ahead of min/max xy's
1.04	09/13/2004	Added more description of the trajectory file layout

1. Trajectory File Format

The trajectory file records the location of each vehicle in a single simulation run for every time step of the simulation. Each trajectory file is expected to be named with a ".trj" (or ".TRJ") extension. It utilizes a binary format in order to keep trajectory files from large network simulations from growing excessively large. The file is organized with a set of records, which are each identified by a single, initial byte value as follows:

Table 1.1 Available record types in the trajectory file.

Record Type	Record ID	Record Description
FORMAT	0	Specifies little or big endian format and version number
DIMENSIONS	1	Specifies X-Y bounds of observation area and scale
TIMESTEP	2	Simulation time
VEHICLE	3	Specifies the location of a single vehicle for the timestep

Each record is of fixed number of bytes (though different record types have different sizes) and is defined in a corresponding table, which lists the fields that will appear in the record in order of appearance, with name-type-value descriptions. See Table 1.2 for an example of the first record. The first record-type byte specifies a FORMAT record, and a FORMAT record, as defined in Table 1.2, contains includes an additional 5 bytes. (Note that all Byte values are encoded unsigned, whereas all Integer and Float types are encoded as signed, 4-byte values.) After the initial record-type field, the next field in the FORMAT record is a single byte value that specifies the "endianess" of the file. This byte is an ASCII formatted capital L if the file is encoded in little endian format, or the byte is an ASCII formatted capital B if the file is encoded in big endian format. This allows easier multi-platform support for the trajectory file format. The next field is the Version, which is specified as a 4-byte floating-point value. The current version of the trajectory file is 1.04.

Table 1.2 Format record description.

Field Name	Type	Value Description
Record Type	Byte	0 = FORMAT record type
Endian	Byte	ASCII 'L' = little endian, used by Intel platforms ASCII 'B' = big endian, used by Motorola (Mac/Unix)
Version	Float	Allows decimal version number, which is currently 1.04

The records of the trajectory file are organized as follows. The file starts with a single FORMAT record, specifying whether multi-byte values are encoded in big or little endian order and what version of the trajectory file is supported. Next, a single DIMENSIONS record specifies the extent of the rectangular region of the vehicle observation area in terms of x-y coordinates. Then, a series of time-steps are encoded consecutively, in chronological order. Each time step begins with a TIMESTEP record, and is followed by a variable number of VEHICLE records, indicating vehicle locations during that time step. The file generally includes several thousand time-steps, and simply terminates when no more data is available. Figure 1 depicts the general layout of the trajectory file in terms of record types.

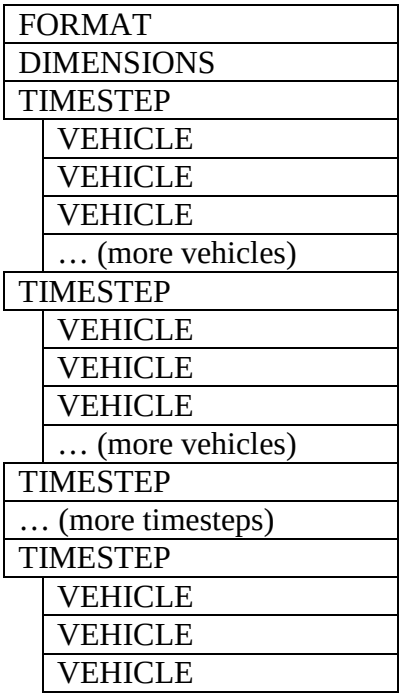

Figure 1 Organization of records in the trajectory file.

The location of all vehicles in a trajectory file is specified using x and y coordinates. The observation area, within which these vehicles travel, is specified as a rectangular region using the DIMENSIONS record, defined in Table 1.3. This region is defined according to a normal Cartesian coordinate system, where the rectangle is parallel to the x and y axes, and x and y values increase to the right and up respectively. As a practical matter, the size of this region must be less than 10 square miles. The rectangular region is perhaps most intuitively scaled at one foot or meter per unit of x or y. Floating point precision is used to specify the scaling, and x-y coordinates. Note that while double precision would accommodate a full global mapping (such as latitude and longitude), it also imposes the need for substantially greater computation time and memory. Thus, single precision coordinates are used as a practical matter at this time.

Table 1.3 Dimensions record description.

Field Name	Type	Value Description
Record Type	Byte	1 = DIMENSIONS record type
Units	Byte	0 = English (i.e., feet, feet/sec, feet/sec^2) 1 = Metric (i.e., meters, meters/sec, meters/sec^2)
Scale	Float	Distance per unit of X or Y (i.e., per "pixel") (e.g., if scale is 0.25 and the units are metric, then x = 0 is 0.25 meters left of x = 1)
MinX	Integer	Left edge of the observation area.
MinY	Integer	Bottom edge of the observation area.
MaxX	Integer	Right edge of the observation area.
MaxY	Integer	Top edge of the observation area.

Each time-step of vehicle data begins with a TIMESTEP record, defined in Table 1.4, which specifies the elapsed time, in seconds, since the start of the simulation (or field observation). This format allows time-steps to be specified in variable precision, though a precision of 1/10th of a second is most likely. Note that data as infrequent as once-per-second could be insufficient for accurate conflict analysis.

Table 1.4 Timestep record description.

Field Name	Type	Value Description
Record Type	Byte	2 = TIMESTEP record type
Timestep	Float	Seconds since the start of the simulation

Following each TIMESTEP a record, a series of VEHICLE records specify the location of each vehicle during the time-step. The VEHICLE record is specified in Table 1.5. All X and Y values are to be encoded as scaled values in the units specified in the DIMENSIONS record. All length, width, speed, and acceleration values are to be encoded as un-scaled values in the units (i.e., feet or meters) specified in the DIMESIONS record.

Table 1.5 Vehicle record description.

Field Name	Type	Value Description
Record Type	Byte	3 = VEHICLE record type
Vehicle ID	Integer	Unique identifier number of the vehicle
Link ID	Integer	Unique identifier number of the link (where possible)
Lane ID	Byte	Unique identifier number of the lane (where possible)
Front X	Float	X coordinate of the middle front bumper of the vehicle
Front Y	Float	Y coordinate of the middle front bumper of the vehicle
Rear X	Float	X coordinate of the middle rear bumper of the vehicle
Rear Y	Float	Y coordinate of the middle rear bumper of the vehicle
Length	Float	Vehicle length (front to back) in Units (feet or meters)
Width	Float	Vehicle width (left to right) in Units (feet or meters)
Speed	Float	Instantaneous forward speed (Units/sec)
Acceleration	Float	Instantaneous forward acceleration (Units/sec^2)

2. Path File Format

This will be specified in detail at a later time.