Standards Change Request

PDS Standards on Sequences   **SCR3-1087.v2**

Problem:

The PDS standards regarding sequences are described in section 12.5.5 of the PDS Standards Reference. This SCR proposes to resolve several inconsistencies and/or ambiguities in this section.

Section 12.5.5, "Sequences", of the Standards Reference states the following:

> A sequence represents an ordered set of values. It can be used to represent arrays and other kinds of ordered data. Only one- and two-dimensional sequences are allowed.
>
> sequence_value :: = sequence_1D | sequence_2D
> sequence_1D :: = **(**scalar_value [**,** scalar_value]***)**
> sequence_2D :: = **(**[sequence _1D] +**)**
>
> A sequence may have any kind of scalar value for its members. It is not required that all the members of the sequence be of the same type. Thus a sequence may represent a heterogeneous record. Each member of a two-dimensional sequence is a one-dimensional sequence. This can be used, for example, to represent a table of values. The order in which members of a sequence appear must be preserved. There is no upper limit on the number of values in a sequence.
>
> For example: AVERAGE_ECCENTRICITY = (0,1,2,3,4,5,9)

1. According to section 12.1.2 on Backus-Naur Form (BNF) notation:

    3. Square brackets enclose optional elements. Elements within brackets occur zero or one

times.

4. Square brackets followed immediately by an asterisk or plus sign specify repeated elements. In the case of an asterisk, the elements in brackets may appear zero, one, or more times. In the case of a plus sign, the elements in brackets must appear at least once. The repetitions occur from left to right.

According to the BNF notation, the current representation of a two-dimensional sequence consists of one or more one-dimensional sequences *not separated by commas*. In order to correctly represent the requirement for a comma between sequences, the notation should read:

> sequence_2D :: = **(**sequence_1D [, sequence_1D]***)**

2. A test MRO HiRISE label submitted to the PDS contained the following line:[1]

> MRO:LOOKUP_CONVERSION_TABLE = (99, (0, 1), 88, (1, 2), 77, (2, 3))

VTool declared this to be invalid. Was VTool correct in identifying this as invalid?

At the 09/20/06 Standards Telecon, it was pointed out that syntactically there is an error in the value, in that the single-valued one-dimensional sequences contained within the two-dimensional sequence need to be enclosed in parentheses. Thus, the line in the label should have read:

> MRO:LOOKUP_CONVERSION_TABLE = ((99), (0, 1), (88), (1, 2), (77), (2, 3))

At the same telecon, it was agreed that the heterogeneity explicitly permitted by the text of 12.5.5 allows for the mix of single- and multiple-element arrays in the above example.

3. The one example of a sequence shown in 12.5.5, while syntactically valid, doesn't make sense. (As Mitch Gordon pointed out in an email, e=0 is a circle, 0<e<1 is an ellipse, and e>1 would indicate hyperbolic orbits.) Another example should be provided to illustrate a two dimensional sequence. The following examples are suggested:

> AVERAGE_ECCENTRICITY = (0.2056, 0.0068, 0.0167, 0.0934, 0.0483, 0.0560)
> MRO:LOOKUP_CONVERSION_TABLE = ((0, 1008), (1009, 1025), (1026, 1043), …)

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[1] Unlike the sample form shown here, the final form used for this keyword by the HiRISE team was correct. Example, MRO:LOOKUP_CONVERSION_TABLE = ((0, 1008), (1009, 1025), (1026, 1043), …)

Current Urgency:

The changes described in this SCR need to be decided on in time to be included in version 3.8 of the Standards Reference, due out hopefully by the end of the summer.

Proposed Solution:

The changes described below in the "Requested Changes" section would be made to section 12.5.5 of the PDS Standards Reference.

Impact Assessment:

Describe the expected impact on existing standards documents, the Planetary Science Data Dictionary, and PDS tools. This includes things like breaking backwards compatibility, affecting current or past archiving activities, and the need for new development efforts.

PDS Standards Reference – Changes as noted above and in the "Requested Changes" section below.

Archive Preparation Guide – none

Proposer's Archive Guide – none

Planetary Science Data Dictionary – none

PDS tools – Verify that VTool correctly validates the modified example under point 2, above.

Existing archives – As stated in the first footnote above, the MRO HiRISE team ended up using a different form than that shown in the test label. There is therefore no impact on existing archives.

Additional Information:

None.

Requested Changes:

The following changes are proposed to section 12.5.5 of the PDS Standards Reference (changes highlighted in red).

A sequence represents an ordered set of values. It can be used to represent arrays and other kinds of ordered data. Only one- and two-dimensional sequences are allowed.

sequence_value :: = sequence_1D | sequence_2D
sequence_1D :: = **(**scalar_value **[,** scalar_value]***)**
sequence_2D :: = **(**sequence _1D **[,** sequence_1D]***)**

A sequence may have any kind of scalar value for its members. It is not required that all the members of the sequence be of the same type. Thus a sequence may represent a heterogeneous record. Each member of a two-dimensional sequence is a one-dimensional sequence. This can be used, for example, to represent a table of values. The order in which members of a sequence appear must be preserved. There is no upper limit on the number of values in a sequence.

Example of a 1D sequence:
AVERAGE_ECCENTRICITY = (0.2056, 0.0068, 0.0167, 0.0934, 0.0483, 0.0560)

Example of a 2D sequence:
MRO:LOOKUP_CONVERSION_TABLE = ((0, 1008), (1009, 1025), (1026, 1043), …)