Flexible Image Transport System

1 Background

FITS, the Flexible Image Transport System, is the standard data format used in astronomy, which is endorsed by the International Astronomical Union and by NASA, and was developed in 1982. The basic format of FITS consists of data in a binary array format, and a plain text (ASCII) header. The header contains information which described the organization, contents and useful information about the array of data.

2 FITS Data Format

The fits data file consists of a header (ASCII) and the data array, which is an N-dimensional array of pixels.

2.1 Header Format

- Each piece of information in the header is a line of information 2880 bytes long.
- Each line consists of a keyword followed by a value and comments.
- Each keyword may be up to 8 characters long, and only contain uppercase letters, numbers, the hyphen and underscore characters.
- The keyword is followed by an equals sign in column 10
- Column 12 has the value of the keyword, which is either an integer, a floating point number, a character string in single quotes, or a Boolean value (T or F)

2.2 Header Content

- The header must begin with a series of required keywords specifying the size and format of the data. As an example:

  SIMPLE = T / file conforms to FITS standard
  BITPIX = 16 / number of bits per data pixel
  NAXIS = 2 / number of data axes
  NAXIS1 = 440 / length of data axis 1
  NAXIS2 = 300 / length of data axis 2

- For astronomical data, the header should also contain useful information about the telescope and observation:

  LATITUDE= 19.8261 / Latitude (degrees N)
  LONGITUDTE = -155.4708 / Longitude (degrees E)
  TELESCOP= ‘2.2m UH ‘ / Telescope used for observation
While most observations usually contain these information fields, the keywords are not standardized, and may be different from observatory to observatory. In many cases, in order for a FITS reader to accurately interpret the information in the header, you sometimes have to tell your software the correspondence between the keywords it is expecting with the keyword names in your header.

2.3 Data Units

The image pixels can have one of 5 supported data types:

- 8-bit integers
- 16-bit integers
- 32-bit integers
- 32-bit single precision floating point real numbers
- 64-bit double precision floating point real numbers.

3 References