

Package: **tivis.r** (via r-universe)

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Title Read Diaspective Vision TIVITA Hyperspectral Recordings

Version 0.1.0

Description Reads hyperspectral imaging data written by the Diaspective Vision TIVITA Suite, used for intraoperative tissue and perfusion imaging. Parses the binary 'SpecCube.dat' container (big-endian float32 samples in band-interleaved-by-pixel order behind a 12-byte dimension header), the German-language acquisition metadata log, and the parameter images the Suite exports alongside each recording (oxygenation, NIR perfusion, tissue haemoglobin and water indices). Requires no vendor SDK and contains no compiled code. Companion to 'cuvis.r', which covers Cubert snapshot cameras, and a data source for 'hyperspectR'.

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URL <https://github.com/cttir/tivis.r>, <https://cttir.github.io/tivis.r/>

BugReports <https://github.com/cttir/tivis.r/issues>

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tivis_available	<i>Is the TIVITA Reader Available?</i>
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Description

Present for symmetry with `cuvis.r::cuvis_available()`. TIVITA support is pure R with no vendor SDK, so this is always TRUE.

Usage

```
tivis_available()
```

Value

TRUE, invisibly usable in conditionals.

Examples

```
tivis_available()
```

tivis_example_file	<i>Path to the Bundled Example Cube</i>
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Description

A small synthetic cube in genuine TIVITA layout, generated by `data-raw/make-fixture.R`. It ships with the package so examples, tests and vignettes run without access to clinical recordings.

Usage

```
tivis_example_file()
```

Value

Path to the bundled *_SpecCube.dat file.

Examples

```
tivis_example_file()
```

tivis_get_metadata	<i>Read TIVITA Acquisition Metadata</i>
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Description

Parses a *_meta.log file written beside a TIVITA recording. The Suite writes an INI-style file with German section and key names, latin1 encoding and comma decimal separators; all three are handled here.

Usage

```
tivis_get_metadata(path)
```

Arguments

path	Path to a *_meta.log file.
------	----------------------------

Details

Numeric-looking values are converted to numbers ("7,000000" becomes 7), TRUE/FALSE become logicals, and surrounding quotes are stripped. Unrecognised values are returned as trimmed strings.

Value

A named list of sections, each a named list of entries. Returns an empty list if the file does not exist.

Examples

```
log_file <- system.file("extdata", "example_meta.log", package = "tivis.r")
if (nzchar(log_file)) str(tivis_get_metadata(log_file))
```

tavis_get_wavelengths *TIVITA Wavelength Axis*

Description

The TIVITA Tissue camera samples 500-995 nm in 5 nm steps. The mapping was confirmed empirically: correlating each band against the TIVITA Suite's own greyscale RGB export peaks at band 12, i.e. 555 nm, which is where human photopic luminous efficiency peaks.

Usage

```
tavis_get_wavelengths(n_bands = 100L)
```

Arguments

n_bands Integer number of bands. Default 100L, the native count.

Value

Numeric vector of band centre wavelengths in nanometres.

Examples

```
range(tavis_get_wavelengths())
```

tavis_list_measurements

Discover TIVITA Recordings Below a Directory

Description

Walks a directory tree and returns one row per recording found. Only headers are read, so scanning a large archive is cheap.

Usage

```
tavis_list_measurements(root, recursive = TRUE)
```

Arguments

root Directory to search.
recursive Logical. Descend into subdirectories. Default TRUE.

Value

A data frame with one row per recording: path, dir, timestamp, width, height, bands, file_size, and n_reference_images. Zero rows if nothing matches.

Examples

```
# tivis_list_measurements("/archive/tivita")
```

tivis_measurement	<i>Read a Complete TIVITA Recording</i>
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Description

Convenience wrapper returning the cube together with everything the Suite stored alongside it: acquisition metadata and the paths of the exported parameter images.

Usage

```
tivis_measurement(path, bands = NULL)
```

Arguments

path	Path to a *_SpecCube.dat file.
bands	Optional integer vector of band indices. NULL reads all.

Value

A list with cube, wavelengths, metadata, references, timestamp and path.

Examples

```
m <- tivis_measurement(tivis_example_file())  
dim(m$cube)
```

`tivis_parse_timestamp` *Parse a TIVITA Filename Timestamp*

Description

TIVITA names every artefact of a recording YYYY_MM_DD_HH_MM_SS_<what>. This extracts the acquisition time from such a name.

Usage

```
tivis_parse_timestamp(x)
```

Arguments

`x` Character vector of file or directory names.

Value

A POSIXct vector, NA where no timestamp is present.

Examples

```
tivis_parse_timestamp("2019_11_25_13_29_24_SpecCube.dat")
```

`tivis_read_cube` *Read a TIVITA Suite Hyperspectral Cube*

Description

Reads a *_SpecCube.dat file written by the Diaspective Vision TIVITA Suite. Unlike Cubert .cu3s session files, the TIVITA container is a plain binary format, so this package needs no vendor SDK and no compiled code.

Usage

```
tivis_read_cube(path, bands = NULL, validate = TRUE)
```

Arguments

`path` Path to a *_SpecCube.dat file.

`bands` Optional integer vector of band indices to read. NULL (default) reads every band. Selecting a subset still reads the whole file, but returns only the requested bands.

`validate` Logical. Check that the file size matches the header before reading. Default TRUE; there is no good reason to disable it.

Value

A numeric array with dimensions (rows, cols, bands) — matching the convention used by `hyperspectR::hsi_cube()` — carrying a `wavelengths` attribute in nanometres.

File format

The format was determined empirically from reference captures and validated against the TIVITA Suite's own `_RGB-Image.png` exports:

- a 12-byte header of three **big-endian** uint32 values giving width, height and bands;
- followed by **big-endian** float32 samples;
- stored **band-interleaved-by-pixel** (BIP): all bands of one pixel are contiguous, pixels run in row-major order (x varies fastest).

Values are calibrated reflectance. They are normally within $[0, 1]$ but may fall slightly below zero or exceed one in specular and saturated regions, so the reader does not clamp them.

See Also

`tivis_read_header()` for header-only access, `tivis_get_wavelengths()` for the wavelength axis.

Examples

```
f <- tivis_example_file()
cube <- tivis_read_cube(f)
dim(cube)
range(attr(cube, "wavelengths"))
```

<code>tivis_read_header</code>	<i>Read a TIVITA Cube Header</i>
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Description

Parses the 12-byte header of a `*_SpecCube.dat` file without reading the sample data, which makes it cheap enough to scan large archives.

Usage

```
tivis_read_header(path, validate = TRUE)
```

Arguments

<code>path</code>	Path to a <code>*_SpecCube.dat</code> file.
<code>validate</code>	Logical. Verify that the file size equals $12 + \text{width} * \text{height} * \text{bands} * 4$. Default <code>TRUE</code> .

Value

A named list with width, height, bands, n_values and file_size.

Examples

```
tavis_read_header(tavis_example_file())
```

```
tavis_reference_images
```

Locate the Parameter Images Beside a Recording

Description

The TIVITA Suite exports its computed parameter maps as PNGs next to each cube: an RGB rendering plus tissue indices. These are the Suite's own results and are useful as a reference when validating independently computed indices.

Usage

```
tavis_reference_images(path)
```

Arguments

path	Path to a *_SpecCube.dat file, or to the directory holding it.
------	--

Value

A named character vector of existing file paths. Names are the parameter identifiers used by the Suite, for example RGB-Image, Oxygenation, NIR-Perfusion, THI, TWI, OHI. Zero-length if none are present.

Examples

```
# tavis_reference_images("/path/to/2019_11_25_13_29_24_SpecCube.dat")
```

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