README for DWP Module

This module consists of five MATLAB functions designed to perform wavelength and pixel conversions using a dispersion wavelength polynomial (DWP) fitting method. These functions are intended for use in optical and spectroscopy applications where precise mapping between pixel positions and wavelength values is required.

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Functions Overview

- **dwp_fit**: Performs a linear fit to map between pixels and wavelengths using an initial guess and optional data exclusion.
- **dwp_fn**: Calculates the dispersion of the DWP module based on a rational function, suitable for converting wavelengths to pixels.
- **dwp_ifn**: Provides the inverse calculation of `dwp_fn`, converting pixels back to wavelengths.
- **dwp_px2wl**: Uses a fitting object to convert an array of pixel values into wavelengths.
- **dwp_wl2px**: Converts an array of wavelengths into pixel values using a fitting object.

Function Details

dwp_fit

- **Purpose**: Fits a linear model to a set of data points.
- **Inputs**:
  - `wl`: Vector of wavelengths.
  - `dis`: Vector of dispersions (pixel values).
  - `param_guess`: Initial guess for the fit parameters.
  - `excluded_data`: Data points to exclude from the fit.
- **Outputs**:
  - `fya`: A fitting object for conversions.
  - `gof`: Goodness-of-fit statistics.

dwp_fn

- **Purpose**: Calculates pixel dispersion based on a rational function.
- **Input**: `x`: Wavelength.
- **Output**: `fx`: Calculated dispersion.

dwp_ifn

- **Purpose**: Calculates the inverse of the dispersion function.

- **Input**: `x`: Dispersion.
- **Output**: `gx`: Corresponding wavelength.

dwp_px2wl

- **Purpose**: Converts pixels to wavelengths using a fitting object.
- **Inputs**:
  - `px`: Vector of pixels.
  - `fya`: Fitting object.
- **Output**: `wl`: Vector of wavelengths.

dwp_wl2px

- **Purpose**: Converts wavelengths to pixels using a fitting object.
- **Inputs**:
  - `wl`: Vector of wavelengths.
  - `fya`: Fitting object.
- **Output**: `px`: Vector of pixels.

Additional Notes

- Ensure the input vectors for wavelengths and pixels are of the same length when using these functions.
- The `dwp_fit` function requires at least two inputs (`wl` and `dis`). Optional parameters include `param_guess` and `excluded_data`.
- The valid range for wavelength inputs in `dwp_fn` and `dwp_ifn` is 400nm to 900nm. Inputs outside this range may result in inaccurate conversions.

Usage Example

To fit a model and then convert between pixels and wavelengths:

```
[fitResult, gof] = dwp_fit(wavelengths, dispersions, [initialGuess]);
convertedWavelengths = dwp_px2wl(pixels, fitResult);
convertedPixels = dwp_wl2px(wavelengths, fitResult);
```

This README provides a basic overview of each function in the DWP module. Users are encouraged to review the function files for detailed comments and implementation notes.