Documentation: SystemSetup Class

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1 Introduction

This document provides detailed documentation for the `SystemSetup` class. The class is designed for managing optical system designs using CODE V software through a Python interface.

2 Class Overview

2.1 SystemSetup

Attributes:

- `cv`: Instance of the CODE V application used for communication with CODE V.
- `surfaces`: List of `Surface` objects representing the optical surfaces in the system.

2.2 Surface (Encapsulated within SystemSetup)

Attributes:

- `parent`: Reference to the parent `SystemSetup` instance.
- `cv`: Instance of the CODE V application inherited from the parent.
- `number`: Numerical identifier of the surface.
- `radius`: Radius of curvature of the surface.
- `thickness`: Thickness of the surface.
- `material`: Material of the surface.
- `radius_variable`: Boolean flag indicating if the radius is variable during optimization.
- `thickness_variable`: Boolean flag indicating if the thickness is variable during optimization.
- `material_variable`: Boolean flag indicating if the material is variable during optimization.

Description: The `Surface` class is encapsulated within the `SystemSetup` class. It represents an individual optical surface in the system. Each `Surface` object is added to the `surfaces` list of its parent `SystemSetup` instance upon creation.

3 Class Methods : SystemSetup

3.1 `__init__`

Description: Initializes a new instance of the SystemSetup class, establishing a connection with CODE V software.
Parameters: None
Return Value: None

```
system_setup = SystemSetup()
```

3.2 start_session

Description: Starts a CODE V session for optical system design.
Parameters: None
Return Value: None

```
system_setup.start_session()
```

3.3 create_new_system

Description: Creates a new lens system in the CODE V environment.
Parameters: None
Return Value: None

```
system_setup.create_new_system()
```

3.4 set_wavelengths

Description: Sets the wavelengths for the optical system.
Parameters: `wavelengths` - List of wavelengths in nanometers.
Return Value: None

```
system_setup.set_wavelengths([486.1, 546.1, 587.6])
```

3.5 set_entrance_pupil_diameter

Description: Sets the entrance pupil diameter of the optical system.
Parameters: `diameter` - Entrance pupil diameter.
Return Value: None

```
system_setup.set_entrance_pupil_diameter(15)
```

3.6 set_dimensions

Description: Sets the measurement unit for the optical system.
Parameters: `dimension_unit` - Unit of measurement (e.g., 'mm' or 'm').
Return Value: None

```
system_setup.set_dimensions('mm')
```

3.7 set_fields

Description: Sets the field points for the optical system.
Parameters: `fields` - List of field points, each a tuple of angle and weight.
Return Value: None

```
system_setup.set_fields([(0, 3), (0, 6)])
```

3.8 optimize_system

Description: Performs optimization of the lens system using CODE V's optimization routines.
Parameters: None
Return Value: None

```
system_setup.optimize_system()
```

3.9 error_fct

Description: Calculates and returns the error function value of the current system configuration.
Parameters: None
Return Value: `float` - Error function value.

```
error_value = system_setup.error_fct()
```

3.10 save_system

Description: Saves the current lens system to a specified file path.
Parameters: `file_path` - File path where the system will be saved.
Return Value: None

```
system_setup.save_system("C:/path/to/file")
```

3.11 stop_session

Description: Stops the current CODE V session.
Parameters: None
Return Value: None

```
system_setup.stop_session()
```

3.12 get_last_surface_number

Description: Returns the number of the last surface in the system.
Parameters: None
Return Value: `int` - Number of the last surface.

```
last_surface_num = system_setup.get_last_surface_number()
```

3.13 get_surface

Description: Retrieves a Surface object corresponding to a given surface number.
Parameters: `surface_num` - The number of the surface to retrieve.
Return Value: `Surface` object.

```
surface = system_setup.get_surface(2)
```

3.14 make_all_thicknesses_fixed

Description: Fixes the thicknesses of all surfaces in the system.
Parameters: None
Return Value: None

```
system_setup.make_all_thicknesses_fixed()
```

3.15 make_all_thicknesses_variable

Description: Makes the thicknesses of all surfaces in the system variable.
Parameters: None
Return Value: None

```
system_setup.make_all_thicknesses_variable()
```

4 Surface Class Methods

4.1 `__init__`

Description: Constructor for the Surface class. Initializes a surface with specified parameters and adds it to the parent SystemSetup instance.
Parameters:

- `parent`: Reference to the parent SystemSetup instance.
- `number`: Numerical identifier of the surface.
- `radius`: Radius of curvature of the surface.
- `thickness`: Thickness of the surface.
- `material` (optional): Material of the surface.

Return Value: None

4.2 `create_surface`

Description: Sends a command to CODE V to create a new surface in the optical system with the initial parameters.
Parameters: None
Return Value: None

4.3 `set_radius`

Description: Sets the radius of curvature for the surface and updates it in CODE V.
Parameters: `radius` - New radius of curvature for the surface.
Return Value: None

4.4 `set_thickness`

Description: Sets the thickness of the surface and updates it in CODE V.
Parameters: `thickness` - New thickness for the surface.
Return Value: None

4.5 `set_material`

Description: Sets the material of the surface and updates it in CODE V.
Parameters: `material` - New material for the surface.
Return Value: None

4.6 `make_radius_variable`

Description: Makes the radius of the surface variable for optimization purposes in CODE V.
Parameters: None
Return Value: None

4.7 `make_thickness_variable`

Description: Makes the thickness of the surface variable for optimization purposes in CODE V.
Parameters: None
Return Value: None

4.8 `make_radius_fixed`

Description: Fixes the radius of the surface, making it non-variable during optimization in CODE V.
Parameters: None
Return Value: None

4.9 `make_thickness_fixed`

Description: Fixes the thickness of the surface, making it non-variable during optimization in CODE V.
Parameters: None
Return Value: None

4.10 `make_material_variable`

Description: Makes the material of the surface variable for optimization purposes in CODE V.
Parameters: None
Return Value: None

4.11 `make_material_fixed`

Description: Fixes the material of the surface, making it non-variable during optimization in CODE V.
Parameters: None
Return Value: None

4.12 `update`

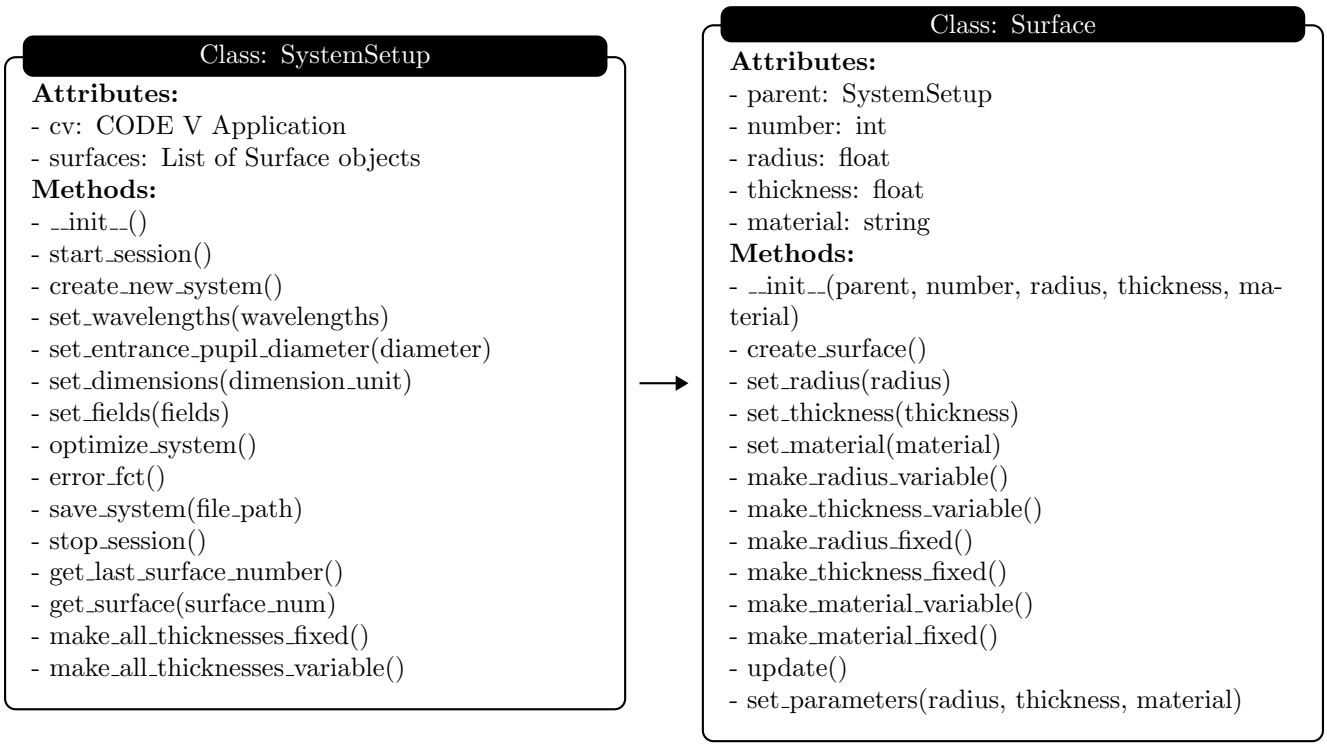
Description: Updates the surface parameters (radius, thickness, and material) in CODE V.
Parameters: None
Return Value: None

4.13 `set_parameters`

Description: Sets multiple parameters (radius, thickness, and optionally material) of the surface at once and updates them in CODE V.
Parameters:

- `radius`: Radius of curvature for the surface.
- `thickness`: Thickness for the surface.
- `material` (optional): Material for the surface.

Return Value: None


Class: SystemSetup
Attributes:
- cv: CODE V Application
- surfaces: List of Surface objects
Methods:
- __init__()
- start_session()
- create_new_system()
- set_wavelengths(wavelengths)
- set_entrance_pupil_diameter(diameter)
- set_dimensions(dimension_unit)
- set_fields(fields)
- optimize_system()
- error_fct()
- save_system(file_path)
- stop_session()
- get_last_surface_number()
- get_surface(surface_num)
- make_all_thicknesses_fixed()
- make_all_thicknesses_variable()
Class: Surface
Attributes:
- parent: SystemSetup
- number: int
- radius: float
- thickness: float
- material: string
Methods:
- __init__(parent, number, radius, thickness, material)
- create_surface()
- set_radius(radius)
- set_thickness(thickness)
- set_material(material)
- make_radius_variable()
- make_thickness_variable()
- make_radius_fixed()
- make_thickness_fixed()
- make_material_variable()
- make_material_fixed()
- update()
- set_parameters(radius, thickness, material)