**CMG Project Documentation**

The CMG read-write project is a C# tool developed to facilitate reading from and writing to CMG binary files.

**Features**

1. **Read CMG Files:** the tool allows users to read data from CMG files. In particular, it reads the properties of CMG cell objects. These properties include the following:

* ‘Mode’: Mode of the cell.
* ‘NbColorMap’: Number of color maps in the cell.
* ‘Class’: Class of the cell.
* ‘Screenx’: X-coordinate of the cell on the screen.
* ‘Screeny’: Y-coordinate of the cell on the screen.
* ‘Stagex’: X-coordinate of the cell in the stage.
* ‘Stagey’: Y-coordinate of the cell in the stage.
* ‘Stagez’: Z-coordinate of the cell in the stage.
* ‘Resolution’: Resolution of the cell.
* ‘LowThreshold’: Low threshold value of the cell.
* ‘MidThreshold’: Mid threshold value of the cell.
* ‘Group’: Group of the cell.
* ‘Width’: Width of the cell.
* ‘Height’: Height of the cell.
* ‘Accession’: Accession of the cell.
* ‘Iod’: Iod value of the cell.
* ‘Flour’: Fluorescence of the cell.
* ‘Diagnosis’: Diagnosis value of the cell.
* ‘RedFaction’: Red faction value of the cell.
* ‘GreenFaction’: Green faction value of the cell.
* ‘BlueFaction’: Blue faction value of the cell.
* ‘Index’: Index of the cell.
* ‘Objective’: Objective of the cell.
* ‘Calibrated’: Calibration status of the cell.
* ‘StackXInt’: X-coordinate of the stack.
* ‘StackYInt’: Y-coordinate of the stack.
* ‘NbBitMap’: Number of bitmaps in the cell.
* ‘CassettePosition’: Cassette position of the cell.
* ‘Vorx’: Vorx value of the cell.
* ‘Vory’: Vory value of the cell.
* ‘BestFocusFrame’: Best focus frame of the cell.
* ‘BackgroundFloat’: Background float value of the cell.
* ‘PrimaryColourChannel’: Primary color channel of the cell.
* ‘Layer’: Layer data of the cell.
* ‘Points’: Points data of the cell.
* ‘RGBOrder’: RGB order data of the cell.
* ‘Images’: Image data of the cell.
* ‘Masks’: Mask data of the cell.

1. **Write to CMG Files:** Users can write data to CMG files, enabling them to modify existing files or create new ones with updated information.
2. **Add Cells to CMG Files:** Users can add a CMG cell with custom features (manually inputted) to an existing or new CMG file.

**Class Documentation**

* **CMGCell Class:**
* **Description:** This class represents one cell and contains all the features of that specific cell object using C# properties.
* **CMGCellList Class:**
* **Description:** This class represents a list of CMGCell objects.
* **Methods:**
  + SetCells(CMGCell[] newCells): Adds newCells to the existing list of cells
  + GetCells(): Returns the list of existing cells.
  + DisplayFeatures(): Displays specific feature values for each cell in a list of CMGCell objects.
  + Add(int screenX, int screenY, int width, int height, byte[] image, byte[] mask, byte[] layer, byte[] points, byte[] RGBOrder): Creates a new CMGCell object with specified parameters and adds it to existing list.
  + SaveToFile(string path, string filename): Saves ‘filename’ to specified path in the CMG file format.
* **CMGReader Class:**
* **Description:** This class is responsible for reading data from input files.
* **Methods:**
  + ReadFromFile(string cmgPath): reads CMG data from a file and returns an array of ‘CMGCell’ objects.
  + ReadCellData(byte[] cmgData, ref int currentIndex): reads data for a single CMG cell from the provided byte array.
* **CMGWriter Class:**
* **Description:** This class is responsible for writing data to CMG files. It contains methods to write data for individual cells to the file in the CMG format.
* **Methods:**
  + WriteCMG(CMGCell[] cells, string path, string filename): writes data for all cells in the provided array to the CMG file specified by the ‘path’ and ‘filename’ parameters. It iterates through each cell and calls the ‘WriteCellData’ method to write data for that cell to the file.
  + WriteCellData(BinaryWriter writer, CMGCell cell): writes the header data, image data, and mask data for a single cell to the provided ‘BinaryWriter’.
* **CMGFileManager Class:**
* **Description:** This class provides functionality to manage CMG files. It contains methods to add new cells, save cells to a CMG file, read CMG data from a file, and display features of the cells.
* **Methods:**
  + Add(int screenX, int screenY, int width, int height, byte[] image, byte[] mask): adds a new ‘CMGCell’ to the ‘cellList’.
  + Save(string path): saves the ‘CMGCellList’ to a CMG file at the specified path.
  + ReadFromFile(string path): reads CMG data from a file and updates the ‘CMGCellList’ with the new cells.
  + WriteToFile(string path): reads CMG data from a file.
  + DisplayFeatures(): displays the features of each cell in ‘CMGCellList’.