

## About @index\_ur user-defined function for Code V

*Yang Zhao*

*University of Rochester*

When designing lenses using gradient-index materials that are constrained to real material properties in Code V, it is essential to have index of refraction at arbitrary spatial coordinate to be calculated correctly and swiftly. To serve that purpose, Code V has provided a built-in function called "index" that allows calculation of index for a specific spatial coordinate. Even though the built-in "index" function is powerful, it is not thread-safe, which means it only uses one thread in one of the cores in the CPU. Such feature makes it ridiculously slow in an optimization sequence, as it only uses a small portion of the full computational power of the computer.

@index\_ur function is programmed to be a thread-safe alternative to the Code V "index" function in order to drastically improve the optimization speed. However, for simplicity it only follows the University of Rochester notation for gradient index.

How to use @index\_ur

1. the @index\_ur is part of the optimization constraints for the GRIN profile. Starting from REV10, "Code V axial and radial and spherical GRIN material constraints", the GRIN design tool distributed by the University of Rochester group, has the @index\_ur integrated in it.
2. To use the @index\_ur function in the optimization, whenever a new Code V session is opened, the @index\_ur function needs to be run once. This can be done by simply drag the index\_ur.seq file to the Code V window or use "in" command in the command window.
3. After the @index\_ur function is run once for a new Code V session, no special operation is needed to use the latest version of "Code V axial and radial and spherical GRIN material constraints" along with the @index\_ur function.