

## Large Exploring Simple Triangular and Hexagonal Grid Polygons Online

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We investigate the online exploration problem (covering) of a short-sighted mobile robot moving in an unknown cellular environment with hexagons and triangles as types of cells. To explore a cell, the robot must enter it. Once inside, the robot knows which of the 3 or 6 adjacent cells exist and which are boundary edges. The robot's task is to visit every cell in the given environment and to return to the start. Our interest is in a short exploration tour; that is, in keeping the number of multiple cell visits small. For arbitrary environments containing no obstacles we provide a strategy producing tours of length  $S \leq C + \frac{1}{4}E - 2.5$  for hexagonal grids, and  $S \leq C + E - 4$  for triangular grids.  $C$  denotes the number of cells — the area —,  $E$  denotes the number of boundary edges — the perimeter — of the given environment. Further, we show that our strategy is  $\frac{4}{3}$ -competitive in both types of grids, and we provide lower bounds of  $\frac{14}{13}$  for hexagonal grids and  $\frac{7}{6}$  for triangular grids.

The strategies were implemented in a Java applet that can be found at:

<http://www.geometrylab.de/Gridrobot/>

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