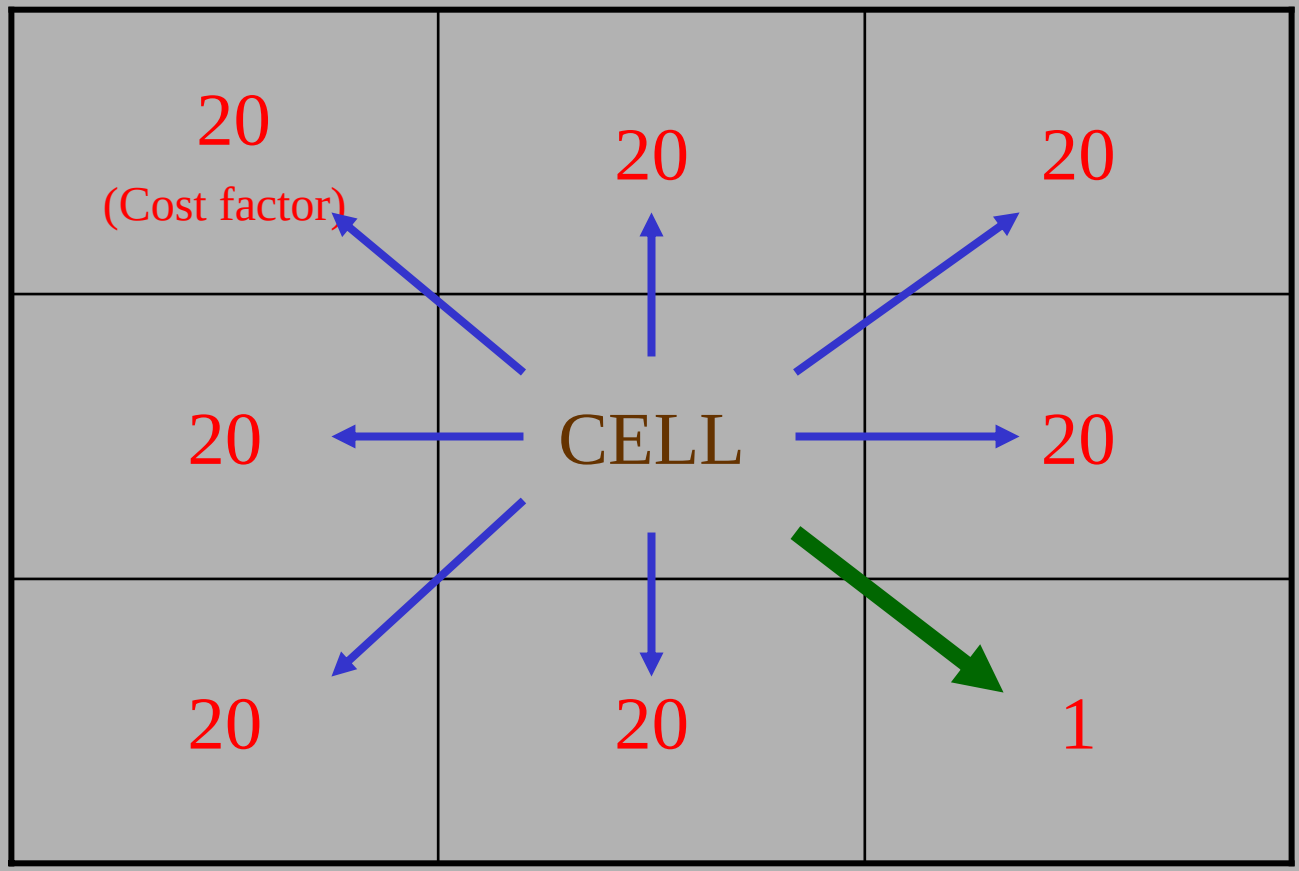
Assembling a cost distance model

- This type of model assumes that traveling over a geographic space increases with distance traveled and with the type of surface
- The cost is based on cells – the distance between cells and the cost of traveling over impediments in the cell

Distances from the current cell

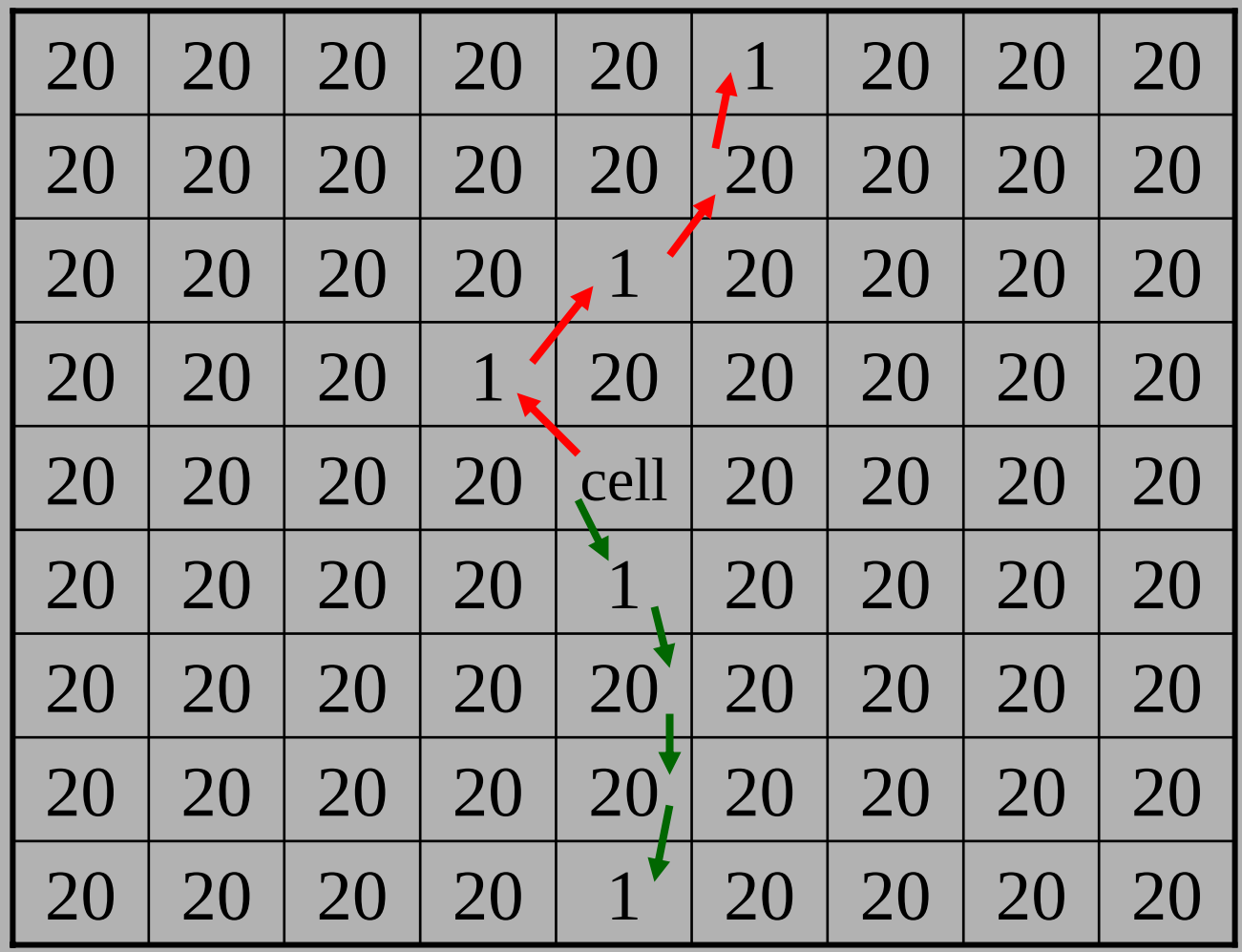
42	30	42
30	CELL	30
42	30	42

Choosing the lowest cost of traveling to a neighboring cell (cost * distance)



Cost factor(1) is multiplied by distance so least expensive cost is 42 units (assuming cellsize of 30 meters)

Finding the lowest cumulative cost route to the boundary



Total cost of red route is 23, total cost of green route is 42 (assuming a cellsize of 1).

Assumptions

- Cell size is 30 meters^2
- Costs of traveling are related to slope
  - 1 unit per meter traveled on flat terrain (up to 3 percent slope)
  - 3 units per meter traveled on intermediate slopes (3 to 6 percent slope)
  - 50 units per meter traveled on steep slopes

Assumptions - continued

- Costs of traveling over different land covers varies with cover:
  - forest is inexpensive (100 units)
  - cropland is expensive (1000 units – assuming land is expensive and owners don't want to sell)
  - Residential land is prohibitively expensive (1,000,000 units – you want to avoid doing this)
  - Additional cover types included in homework (wetlands, etc)

Assumptions - continued

- The cost of traveling over stream varies with the volume of the stream (based on area of watershed)
  - 5,000 units for values less than 5000 cells
  - 10,000 units for values from 5000 to 50,000 cells
  - 50,000 units for values greater than 50,000 cells

Assembling the data

- From the digital elevation model
  - Slopes: reclassify based on parameters in slide 2
- From the land cover database
  - Land cover: reclassify based on parameters in slide 3
- From the accumulation cost grid (supplied)
  - Potential volume of stream flow: based on parameters in slide 4

Datasets

- dem
- landcover
- start_grid
- stop_grid
- river_grid (easy to cross because of width)

Creating a cost grid

- Merging data from the reclassified slope, land cover, and flow accumulation grid
  - Accomplished through addition of the three costs for the area using the raster calculator

Creating the distance grid

- Based on the cost grid
- Using the cost distance function to find the cost of traveling to any point from the start grid

Finding the least cost path

- Using the cost distance grid, the least cost path is determined, based on your assumptions
- Determines the minimum cumulative cost from traveling from the start_grid to the stop_grid