King Abdullah University of Science and Technology

Fall 2015 CS 247 Scientific Visualization Assignment 3

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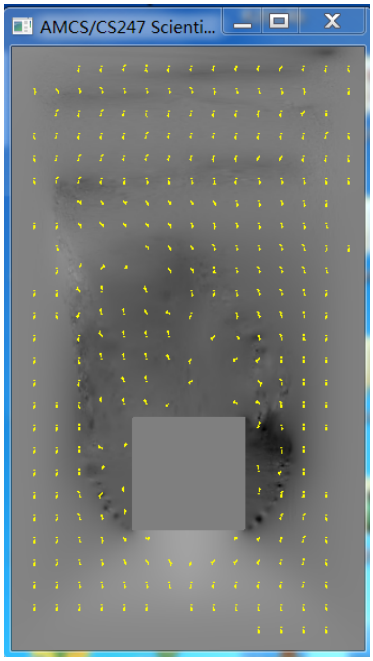
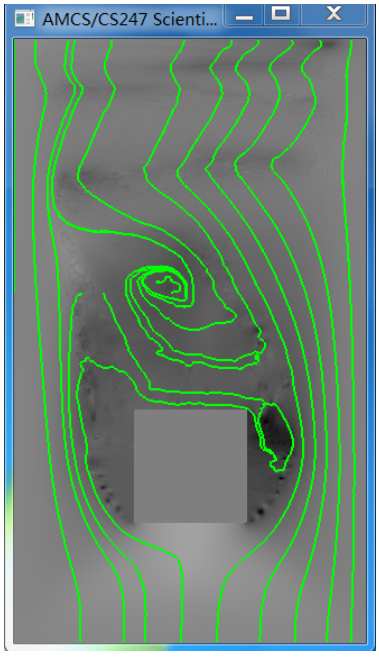
1 Glyph visualization

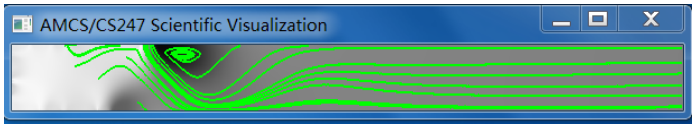
Some basic matrix transformation in computer graphics, for instance, translation, rotation, scale can be used to draw arrows for vector field visualization.

```
void draw_arrow_head(float head[2], float direct[2])
{
  float M_PI = 3.1415926;
  glPushMatrix();
  glTranslatef(head[0], head[1], 0);
  glRotatef(atan2(direct[1], direct[0]) * 360 / (2 * M_PI), 0, 0, 1);
  glScalef(0.03, 0.03, 1);
  glBegin(GL_TRIANGLES);
  glVertex2f(0, 0);
  glVertex2f(-0.35, 0.12);
  glVertex2f(-0.35, -0.12);
  glEnd();
  glPopMatrix();
}
```



2 Streamlines

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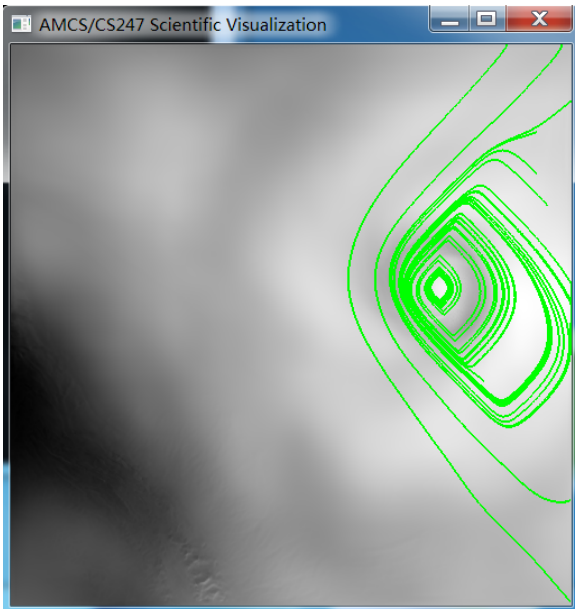
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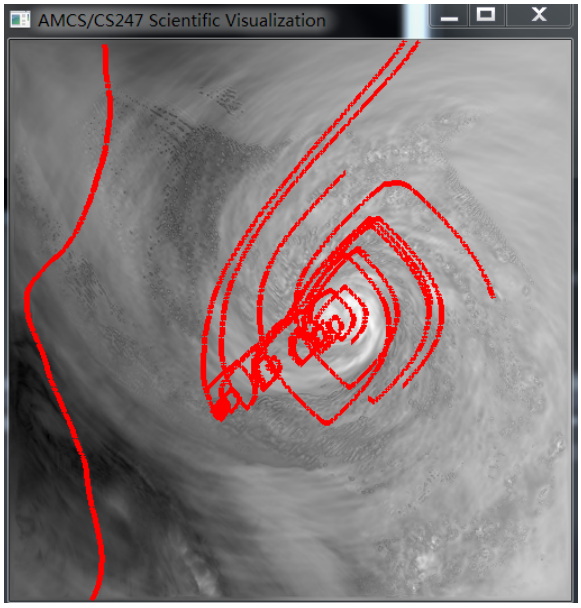
3 Pathlines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4 Bonus

1. multiple streamline seeds

for horizontal rake:

```
stream_pos.clear();
    if (isStreamline == true)
    {
      for (int i = 0; i < vol_dim[0]; i+=samp_rate)
      {
        stream_pos.push_back(i);
        stream_pos.push_back(seed_y);
      }
    }
```

for vertical rake:

```
stream_pos.clear();
    if (isStreamline == true)
    {
      for (int i = 0; i < vol_dim[1]; i += samp_rate)
      {
        stream_pos.push_back(seed_x);
        stream_pos.push_back(i);
      }
    }
```

2. scalar field images

```
case 's':
    current_scalar_field = (current_scalar_field + 1) % num_scalar_fields;
    DownloadScalarFieldAsTexture();
    fprintf(stderr, "Scalar field changed.\n");
    break;
```

3. RK4

It's very similar to RK2 and easy to implement.