Session 2 : Exercise

Code for download: session2_start.tar.gz

Update login script:

To get the environment setup called automatically when a new terminal is open, you can add the commands for this setting in your login script, which is in our case in `$HOME/.bash_profile` file. Open this file in your editor and add the following lines:

```
# Geant4 environment
export CMAKE_PREFIX_PATH=/usr/local/opt/qt5
. /usr/local/bin/geant4.sh
unset DYLD_LIBRARY_PATH
```

Exercise 2a:

The picture shows geometry which will be implemented in this session.

- Inspect the code of the implemented geometry and modify materials to correspond to the geometry description below. The code already present describes the geometry of the first arm detector.
  - Identify the code used for printing all materials.
- Implement geometry of a second arm described below.
  - *Get inspired by the code already present*
  - ***Proceed step by step. After adding each piece of geometry, recompile and test your application with visualization.***
  - *Note that the Second Arm detector has similar components as the First Arm detector.*

Exercise 2b:

Explore implemented geometry:

- Add visualization attributes for added volumes in vis.mac macro
- Add axes on your scene to check your geometry
- Check your geometry with geometry tree browser and with tracking geantinos with tracking verbose level=1
- Add the run and event number in the viewer (use User Interface online help)

Geometry already implemented:

- Material `Air` defined using NIST manager
- World volume
  - represented as a box of `hx=10.*m, hy=3.*m, hz=10.*m`
  - of `Air` material
- Tube volume
  - of a tube shape with `rmin = 0.*m, rmax=1.*m, hz=1.*m`

    - of `Air` material
- First arm detector:
    - represented as a box of `hx=1.5*m, hy=1.0*m, hz=3.0*m`
    - of `Air` material
    - placed in `-5.*m` in z-direction (in front of `Tube` *(in blue colour).*)
    - including:
        1. 5 Drift chambers *(in green colour)*
            - of a box shape with `hx=1.*m, hy=30.*cm, hz=1.*cm`
            - of `Argon gas` material
            - placed along z-axis with a distance of `0.5*m` from each other with the middle one in the center of the parent volume
        2. Wire plane
            - of a box shape with `hx=1.*m, hy=30.*cm, hz=0.1*mm`
            - of `Copper` material
            - placed inside each drift chamber in its center.

Geometry to be implemented:

- Add following materials (using NIST manager): Argon gas (`G4_Ar`), CsI (`G4_CESIUM_IODIDE`) and Copper (`G4_Cu`) and update materials in First Arm detector
- Second arm detector
    - represented as a box of `hx=1.5*m, hy=1.*m, hz=3.*m`
    - of `Air` material
    - placed in `5.*m` in z-direction (behind `Tube` *(in blue colour)*).
    - Including:
        1. 5 Drift chambers *(in green colour)*
            - of a box shape with `hx=1.5*m, hy=30.*cm, hz=1.*cm`
            - of `Argon gas` material
            - placed along z-axis with a distance of `0.5*m` from each other with the middle one in the center of the parent volume.
        2. Wire plane
            - of a box shape with `hx=1.5*m, hy=30.*cm, hz=0.1*mm`
            - of `Copper` material
            - placed inside each drift chamber in its center
        3. EM calorimeter *(in yellow colour)*
            - of a box shape with `hx=1.5*m, hy=30.*cm, hz=15.*cm`
            - of `CsI` material
            - placed at `2*m` in z-direction from the center of its parent volume (Second Arm Detector).
        4. Fill the EM calorimeter with `15*cm` layers along x-direction of the same material (CsI)

    Solution: session2_solution.tar.gz
