The F1tenth website has a tutorial for where they play bagged laser message and use Hector SLAM to develop a map. In the tutorial the tutorial.launch file provided by the Hector SLAM ROS package is modified to launch and use Hector SLAM. The modifications involved using the tf node to publish transformations between the world and the map coordinate frames and between the laser scanner and robot base frames. The tutorial can be found in the following YouTube link:

https://www.youtube.com/watch?v=3C_eRtSoU78

However, additional modifications will be required to use Hector SLAM to develop a map from only laser scan data. The base frame and odometry frame can be associated with the same coordinate frame and transformation to the laser frame. This can be accomplished by first setting the “base_frame_to_laser" to publish a transformation between the laser frame and a base frame with name set as “base_link”. Afterwards, the mapping_default.launch file needs to modified where the base and odometry frames are under the same coordinate frame. The modifications to the tutorial.launch and mapping_default.launch files are shown below in blue.

tutorial.launch

```
<?xml version="1.0"?>

<launch>

 <arg name="geotiff_map_file_path" default="$(find hector_geotiff)/maps"/>

 <param name="/use_sim_time" value="true"/>

 <node name="static_tf0" pkg="tf" type="static_transform_publisher" args="1 0 0 0 0 0  /world /map 100"/>

 <node pkg="tf" type="static_transform_publisher" name="base_frame_to_laser"
  args="0.0 0.0 0.0 0.0 0.0 0.0 /base_link /laser 10" />

 <node pkg="rviz" type="rviz" name="rviz"
  args="-d $(find hector_slam_launch)/rviz_cfg/mapping_demo.rviz"/>

 <include file="$(find hector_mapping)/launch/mapping_default.launch"/>

 <include file="$(find hector_geotiff)/launch/geotiff_mapper.launch">
  <arg name="trajectory_source_frame_name" value="scanmatcher_frame"/>
  <arg name="map_file_path" value="$(arg geotiff_map_file_path)"/>
 </include>

</launch>
```

mapping_default.launch

```
<?xml version="1.0"?>

<launch>
 <arg name="tf_map_scanmatch_transform_frame_name" default="scanmatcher_frame"/>
 <arg name="base_frame" default="base_link"/>
 <arg name="odom_frame" default="base_link"/>
 <arg name="pub_map_odom_transform" default="true"/>
 <arg name="scan_subscriber_queue_size" default="5"/>
 <arg name="scan_topic" default="scan"/>
 <arg name="map_size" default="2048"/>
 …
</launch>
```