**Flowchart untuk Setiap Tahap Program**

**1. Pre-Processing (image\_adjust.m)**

Start

|

|--> Load Image Folder

|--> Resampling Resolution (256x256)

|--> Adjust Brightness & Contrast

|--> Apply Gaussian Filtering

|--> Apply Median Filtering

|--> Apply Thresholding

|--> Save Processed Image

|

End

**2. Edge Detection using SCPM**

Start

|

|--> Load Pre-Processed Image

|--> Convert to Negative Field (Internal Force Calculation)

|--> Compute External Coulomb & Spring Forces

|--> Simulate Particle Movement (Spring-Charged Particles Model)

|--> Extract Final Tumor Boundary

|--> Save Edge Detection Result

|

End

**3. Shape Irregularity Analysis (Circular Hough Transform)**

Start

|

|--> Load Edge-Detected Image

|--> Apply Circular Hough Transform

|--> Compute Circularity Measure

|--> Save Shape Irregularity Data

|

End

**4. Edge Sharpness Analysis (ESAP)**

Start

|

|--> Load Edge-Detected Image

|--> Compute Gray-Level Intensity Changes

|--> Apply Parametric Modeling for Edge Sharpness

|--> Extract Margin Sharpness Features

|--> Save Edge Sharpness Data

|

End

**5. Classification using K-Nearest Neighbors (KNN)**

Start

|

|--> Load Shape Irregularity & Edge Sharpness Data

|--> Train KNN Model with BI-RADS Categories

|--> Classify New Tumor Lesion

|--> Output Classification Result

|

EndStart

|

|--> Load Shape Irregularity & Edge Sharpness Data

|--> Train KNN Model with BI-RADS Categories

|--> Classify New Tumor Lesion

|--> Output Classification Result

|

End