

This code is used to sort MPs into morphology categories. To do this you will need the output of the Particles8 plugin from ImageJ along with the bitmap of the Particle Finder image for your sample.

Copy and paste the following line of code to load the tidyverse package
library(tidyverse)

Read in the sample data .csv file
MPs=read.csv(file.choose(), header = T)

Set row headers based on the Particle_ID column
row.names(MPs)=MPs\$Particle_ID

Read in the ImageJ data .csv file
Particles=read.csv(file.choose(), header = T)

#Read in image data .csv file (Xpos,Ypos,sizeX,sizeY,Xpxl,Ypxl)
ImageData=read.csv(file.choose(), header = T)
Xpos = ImageData\$Pos..X
Ypos = ImageData\$Pos..Y
SizeX = ImageData\$Size.X.
SizeY = ImageData\$Size.Y.
PixelX = ImageData\$PixelSizeX.
PixelY = ImageData\$PixelSizeY.
Xmax = Xpos * PixelX
Ymax = Ypos * PixelY

Convert column names if needed
names(MPs)[names(MPs) == "Center.X..µm."] <- "Center_X"
names(MPs)[names(MPs) == "Center.Y..µm."] <- "Center_Y"
names(MPs)[names(MPs) == "Center.X..m."] <- "Center_X"
names(MPs)[names(MPs) == "Center.Y..m."] <- "Center_Y"
names(MPs)[names(MPs) == "Particle.ID"] <- "Particle_ID"

Add a new column to convert XM to pixels from microns
df <- as_tibble(MPs)
MPsMod <- df %>%
 mutate(Center_X_Con = (Center_X-Xmax)/PixelX)

Add a new column to convert YM to pixels from microns
df <- as_tibble(MPsMod)
MPsCon <- df %>%
 mutate(Center_Y_Con = (SizeY-((Center_Y-Ymax)/PixelY)))

Compare the XM and YM from Particles to the Center_X and Center_Y from MPs. If the absolute difference is <10 microns, create a new column in Particles with the matching number from ParticleID in MP
#Create variables for row counter and particle index
row.counter.MPsCon = 1
particle.index = 1
#set data frame to Particles and create new Particle_ID column in Particles
Particles\$Particle_ID = NA
df <- Particles

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#Check if absolute differences in X and Y are both <1. If so, assign
ParticleID column value in Particles as value from the matching row in
MPsCon
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#Compare Opus MPs to ImageJ particles.
while (row.counter.MPsCon <= nrow(MPsCon)){
  if(particle.index > nrow(Particles)){
    particle.index = 1
    row.counter.MPsCon = row.counter.MPsCon + 1
  } else{
    if((abs(Particles$XM[particle.index]-
MPsCon$Center_X_Con[row.counter.MPsCon])) > 5 |
(abs(Particles$YM[particle.index]-
MPsCon$Center_Y_Con[row.counter.MPsCon])) > 5){
      particle.index = particle.index + 1
    } else{
      df$Particle_ID[particle.index] =
as.numeric(MPsCon[row.counter.MPsCon,"Particle_ID"])
      row.counter.MPsCon = row.counter.MPsCon + 1
      particle.index = 1
    }
  }
}
```

```
# Count number of assigned particles to check results
#sum(!is.na(df$Particle_ID))
# Use Particle_ID column to combine data
Full.MP.Data = right_join(df, MPsCon, by="Particle_ID")
#save data
write.csv(Full.MP.Data, file = "*file name*_Joined.csv", row.names =
FALSE)
```

```
# Manually match any unmatched particles, then read file back in
Full.MP.Data=read.csv(file.choose(), header = T)
```

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#convert perimeter, area, and max Feret from pixels into microns
df <- as_tibble(Full.MP.Data)
Full.MP.Data.Perim <- df %>%
  mutate(Perim_um = df$Perim * round(PixelX,3))
df <- as_tibble(Full.MP.Data.Perim)
Full.MP.Data.Feret <- df %>%
  mutate(Feret_um = df$Feret * round(PixelX,3))
df <- as_tibble(Full.MP.Data.Feret)
Full.MP.Data.Area <- df %>%
  mutate(Area_um = df$Area * (round(PixelX,3))^2)
```

```
# Classify morphologies based Schnepf et al 2023 paper
df <- as_tibble(Full.MP.Data.Area)
Full.MP.Data.Morphs <- df %>%
  mutate(Morphology = case_when(
    df$AspRatio > 3 ~ "Fiber",
    df$Circ > 0.6 ~ "Spherical Particle",
```

```
df$Circ <= 0.6 ~ "Irregular Particle"))  
#save data  
write.csv(Full.MP.Data.Morphs, file = "*file name*_Joined_Morph.csv",  
row.names = FALSE)
```