Mazurka paper figures

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8/20/2018

Suggested order

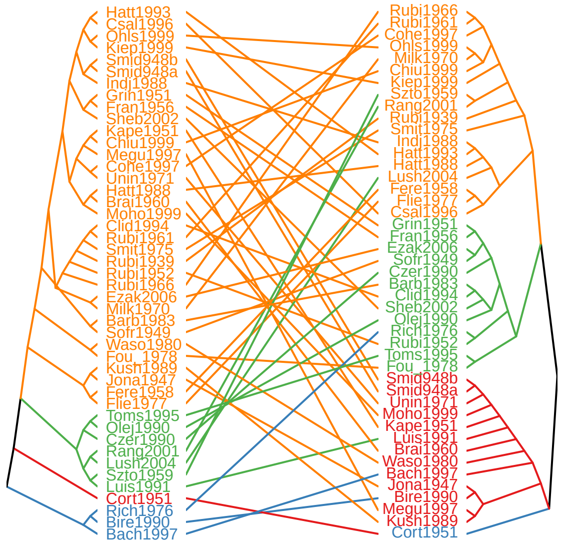
1. Parameter interpretation in Fliere
2. Using parameters to examine two different performances
3. Clustering performances (compare the clusters)
    a. what can we say about the parameters of each cluster? what is different about them?
4. Similar performances (Rubinstein)
5. Model issues

Comparing clusters

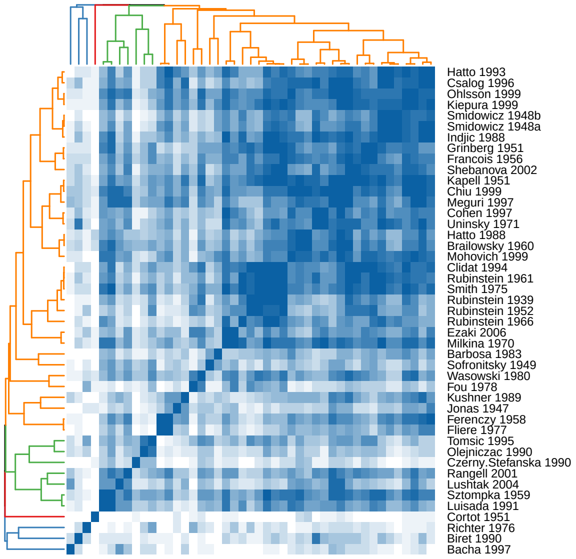
```
perfs = tempos[,-c(1:3)] %>% as.matrix %>% t
bad_perf = grep('Block',rownames(pvec_ml))
hc_parm = pvec_ml[-bad_perf,] %>% dist %>% percentize %>% hclust
hc_perf = perfs[-bad_perf,] %>% dist %>% percentize %>% hclust
short_labs = rownames(perfs)[-bad_perf]
lens = nchar(short_labs)
short_labs = paste0(substr(short_labs,1,4), substr(short_labs,lens-3,lens))
hc_parm$labels = short_labs
hc_perf$labels = short_labs
dend_parm = hc_parm %>% as.dendrogram
dend_perf = hc_perf %>% as.dendrogram

dend_parm = dend_parm %>% set('labels_col', value=fivecolors[1:4], k=4) %>%
  set('branches_lty', 1) %>%
  set('branches_k_color', value=fivecolors[1:4], k=4)
dend_perf = dend_perf %>% set('labels_col', value=fivecolors[1:4], k=4) %>%
  set('branches_lty', 1) %>%
  set('branches_k_color', value=fivecolors[1:4], k=4)
col_lines_by_left_groups <- fivecolors[cutree(dend_parm, 4, order_clusters_as_data=FALSE)]
```

```
tanglegram(dend_parm,dend_perf, color_lines = col_lines_by_left_groups,
           columns_width = c(1,1,1), axes=FALSE, rank_branches = TRUE, type='t',
           # left_dendo_mar = c(0,1,0,8), right_dendo_mar = c(0,8,0,1),
           margin_top = 0,
           margin_bottom = 0, margin_inner = 3.5,
           #remove_nodePar = TRUE,
           lab.cex=.75, lwd=1, edge.lwd=1)
```

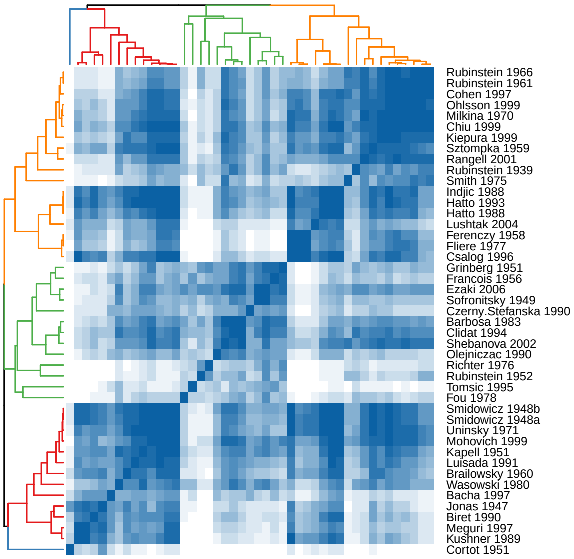


```
heatmap.2(as.matrix(percentize(dist(pvec_ml[-bad_perf,]))),
          Rowv = dend_parm, Colv = dend_parm,
          symm=TRUE,
          density.info = 'none', trace='none',
          labRow = sub('_',' ',row.names(pvec_ml)[-bad_perf]),
          labCol = NA,
          key.title = NA,
          col=colorRampPalette(c('#0b61a4','white')),
          key.xlab = NA,
          margins = c(1,6),
          cexRow = .6,
          cexCol = .6,
          lhei=c(1,8),
          lwid=c(1,8),
          offsetCol = 0, offsetRow = 0,
          key=FALSE
)
```



```r
clusts = cutree(as.hclust(dend_parm), k = 4)
save(clusts, file = '../extras/ClusterLabels.Rdata')
```

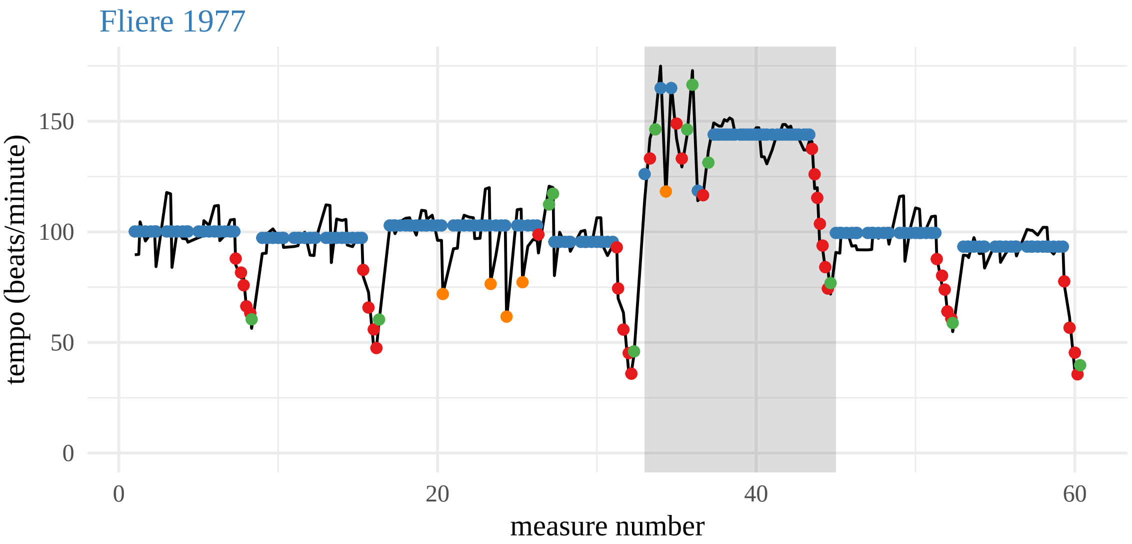
```r
heatmap.2(as.matrix(percentize(dist(perfs[-bad_perf,]))),
          Rowv = dend_perf, Colv = dend_perf,
          symm=TRUE,
          density.info = 'none', trace='none',
          labRow = sub('_',' ',row.names(pvec_ml)[-bad_perf]),
          labCol = NA,
          key.title = NA,
          col=colorRampPalette(c('#0b61a4','white')),
          key.xlab = NA,
          margins = c(1,6),
          cexRow = .6,
          cexCol = .6,
          lhei=c(1,8),
          lwid=c(1,8),
          offsetCol = 0, offsetRow = 0,
          key=FALSE
)
```



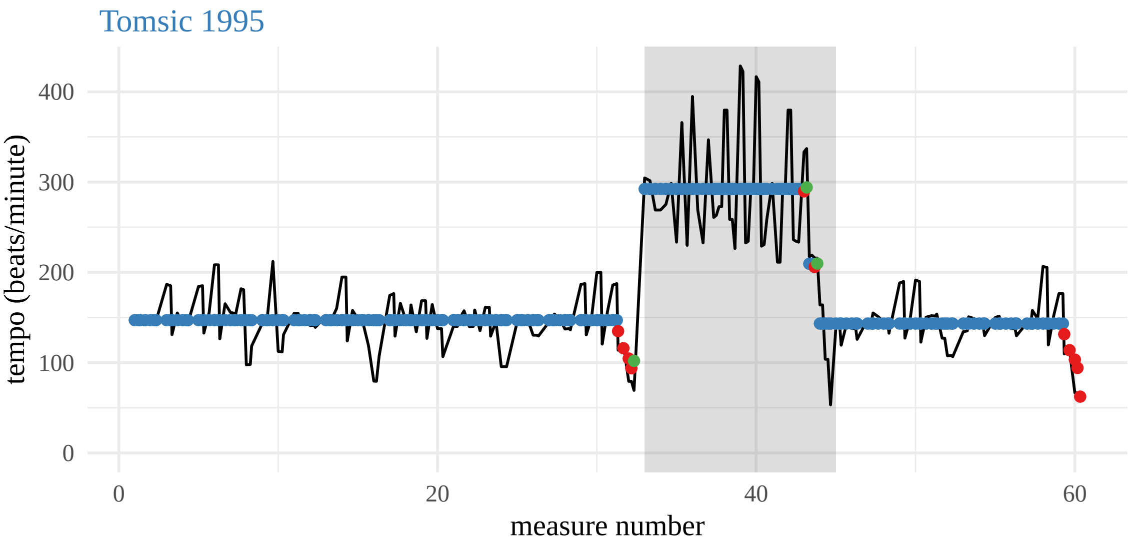
Interpreting parameters

```r
plotStates <- function(performers, pars, tempos,
                       noplot=FALSE,
                       particleNumber = 200,
                       initialMean = c(132,0),
                       initialVariance = c(400,10)){
  lt = diff(c(tempos$note_onset, 61))
  alldfs = NULL
  for(perf in performers){
    params = unlist(pars[row.names(pars)==perf,])
    y = matrix(tempos[[perf]], nrow = 1)
    mats = yupengMats(lt, params[1], params[2:4], params[5:8],
                      params[9:12], initialMean, initialVariance)
    bs = beamSearch(mats$a0, mats$P0, c(1,0,0,0,0,0,0,0), mats$dt,
                      mats$ct, mats$Tt, mats$Zt,
                      mats$Rt, mats$Qt, mats$GGt, y, mats$transMat, particleNumber)
    bestpath = bs$paths[which.max(bs$weights),]
    kal = kalman(mats, bestpath, y)
    df = data.frame(performer=perf, measure = tempos$note_onset, tempo = c(y),
                    inferred = c(kal$ests), state = convert8to4(bestpath))
    alldfs = rbind(alldfs, df)
  }
  if(noplot) return(alldfs)
  ggplot(alldfs, aes(x=measure, y=tempo)) + ylim(0, max(df$tempo)) +
    annotate('rect',xmin = 33, xmax = 45, ymin = -Inf, ymax = Inf,
             alpha=.2) +
    theme_minimal(base_family = 'Times') +
    geom_line(aes(y=tempo), color='black')+
    geom_point(aes(y=inferred),color=fivecolors[alldfs$state])+
    facet_wrap(~performer, labeller = as_labeller(function(x) gsub('_',' ', x))) +
    theme(legend.position = 'none', legend.title = element_blank())+
    ylab('tempo (beats/minute)') + xlab('measure number') +
    theme(strip.text = element_text(size=12, hjust=0,color = fivecolors[1]))
          #strip.background = element_rect(fill='grey90',linetype = 'blank'))
}
```

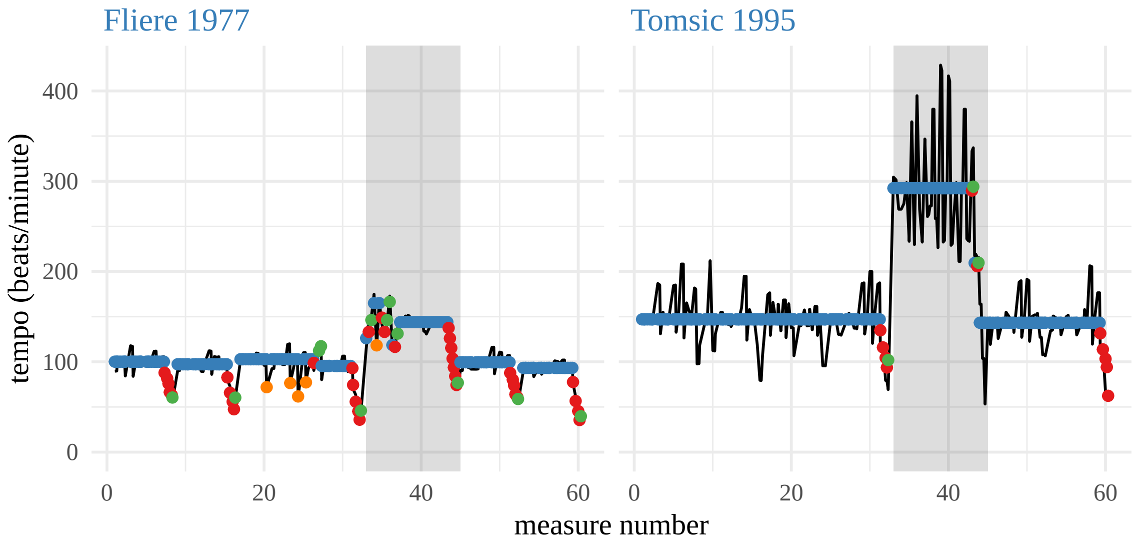
```
remove(pvec_ml)
load("mazurka2results.Rdata")
perfs = c('Fliere_1977','Tomsic_1995')
plotStates(perfs[1], pvec_ml, tempos)
```



```
plotStates(perfs[2], pvec_ml, tempos)
```



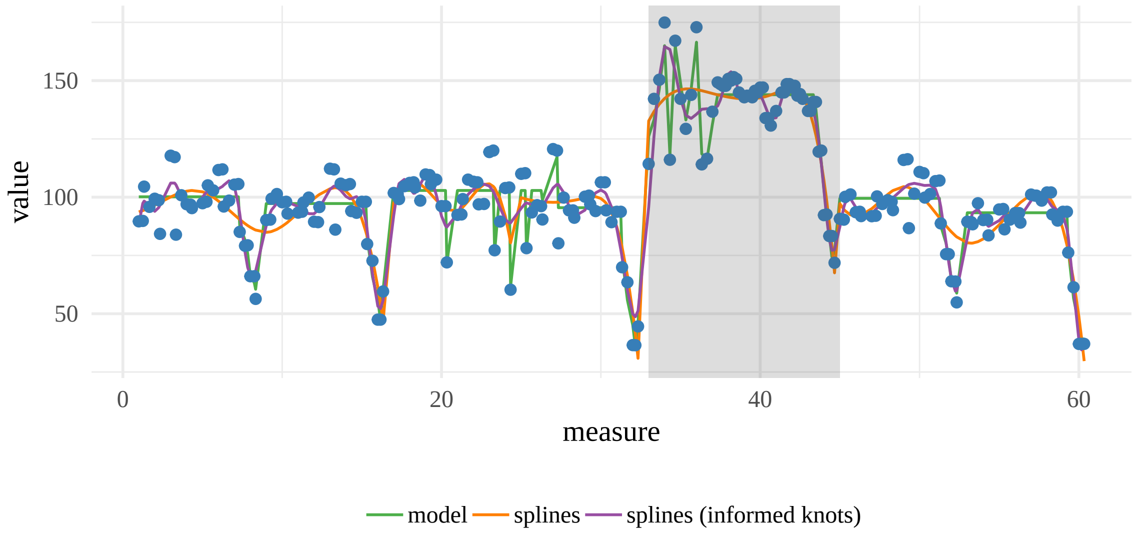
```
plotStates(perfs, pvec_ml, tempos)
```



Different smoothing

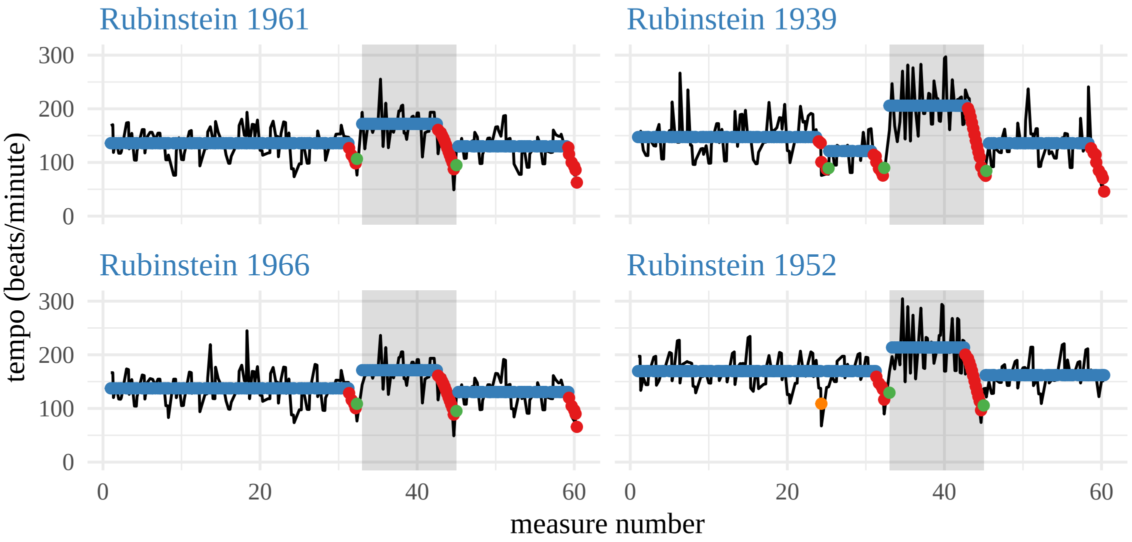
Try splines, replicating knots, l1tf?

```
nsplines = 64 # 1 knot per bar plus boundary
B = bs(tempos$note_onset, df=nsplines, intercept = TRUE)
preds_smooth = fitted(lm(tempos[[perfs[1]]]~B-1))
single.knots = match(seq(4,56,by=4)+1,tempos$meas_num)
double.knots = match(c(16,24,32,44)+1, tempos$meas_num)
triple.knots = match(c(16,24,32,44)+1, tempos$meas_num)
quad.knots = match(c(16,24,32,44)+1, tempos$meas_num)
all.knots = tempos$note_onset[
  sort(c(single.knots,double.knots,triple.knots,quad.knots))]
B1 = bs(tempos$note_onset, knots = all.knots, intercept = TRUE,Boundary.knots = c(1,61))
preds_music = fitted(lm(tempos[[perfs[1]]]~B1-1))
extras=data.frame(x=tempos$note_onset,y1=preds_smooth,y2=preds_music)
perf1 = plotStates(perfs[1], pvec_ml, tempos, noplot = TRUE)
perf1$ss = preds_smooth
perf1$ms = preds_music
perf1 %>% select(measure, ss, ms, inferred) %>%
  gather(key='key',value='value',-measure) %>%
  ggplot(aes(x=measure)) + geom_line(aes(y=value, color=key)) +
  scale_color_manual(values = fivecolors[c(3,4,5)],
                     labels = c('model','splines','splines (informed knots)')) +
  geom_point(data=perf1, aes(x=measure, y=tempo), color=fivecolors[1]) +
  annotate('rect',xmin = 33, xmax = 45, ymin = -Inf, ymax = Inf,
           alpha=.2) +
  theme_minimal(base_family = 'Times') +
  theme(legend.position = 'bottom',legend.title = element_blank())
```



Similar performances

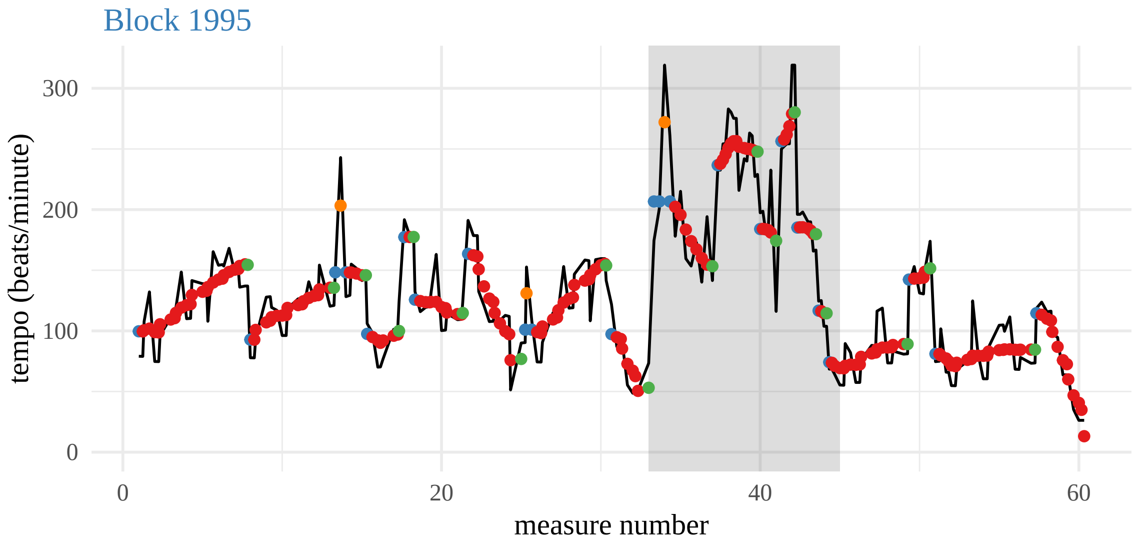
```
rubins = row.names(pvec_ml)[grep('Rubinstein', row.names(pvec_ml))]
plotStates(rubins, pvec_ml, tempos)
```



```
# note that the 1939 recording is the only one in a different cluster
```

Bad estimation

```
plotStates('Block_1995', pvec_ml, tempos)
```



Problems with the model

- Problem with retransitioning to state 1
- states 2 and 3 aren't constrained to always decrease/increase, only in mean
- state 4 may not always emphasize a slow down
- previous 2 have to do with Gaussian assumptions
- necessity for strong priors
- but priors are on parameters, not on path (how would we want this to change?)