MOVES

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Overview

The District is undertaking a MOVES excercise as part of planning work. It will require multiple MOVES scenarios to be run. To ease the proess and the replicability (and to improve my R skills) I wrote a MOVES package for R.

Is this perfect. No. Right now I would desribe it as dev. But I have already put it to use and think having a few MOVES experts working on it together could get it to be something to contribute to the larger commmunity.

What it does (so far):

1. Reads in county data manager tables and joins them with applicable descriptive tables
2. Reads in output tables and joins them with applicable descriptive tables
3. Create a county data manager table
4. Replace a county data manager table
5. Run MOVES inline after creation of RunSpec

What it could do:

1. Read in project level tables and join them with applicable descriptive tables
2. Have standard QA plots
3. Expand to be compatible with older versions of MOVES
4. ?What else

Now let's walk through a script.

Loading Libraries

Note that this is set up so that the moves library itself calls the database library. Theoretically MarieDB shoudl be easily swapped in to that library.

```
library(r4moves)
library(dplyr)
library(ggplot2)
```

Set Up DB Connections

Here we are going to set all of the variables we are going to need and make a connection to the MOVES database:

```
password <- 'K7j0Ret79TwUIjxZExbZ'
movesdb_name <- 'movesdb20180517'
countydb_name <- 'ozn_dc_2017_naaq_in'
outputdb_name <- 'ozn_dc_2017_naaq_out'

dbconn <- makeDBConnection(user = 'root', password=password)
```

Get a Table

Here is an example fecth of an input table:

```
data <- getAverageSpeedBin(dbconn, movesdb_name, countydb_name)
print(head(data,5))
```

```
##   avgSpeedFraction hourDayID dayID hourID avgSpeedBinID avgBinSpeed
## 1                0        15     5      1             1         2.5
## 2                0        15     5      1             2         5.0
## 3                0        15     5      1             3        10.0
## 4                0        15     5      1             4        15.0
## 5                0        15     5      1             5        20.0
##              avgSpeedBinDesc opModeIDTirewear opModeIDRunning roadTypeID
## 1             speed < 2.5mph              401              NA          2
## 2   2.5mph <= speed < 7.5mph              402              NA          2
## 3  7.5mph <= speed < 12.5mph              403              NA          2
## 4 12.5mph <= speed < 17.5mph              404              NA          2
## 5  17.5mph <= speed <22.5mph              405              NA          2
##                 roadDesc rampFraction isAffectedByOnroad isAffectedByNonroad
## 1 Rural Restricted Access         0.08                 1                   0
## 2 Rural Restricted Access         0.08                 1                   0
## 3 Rural Restricted Access         0.08                 1                   0
## 4 Rural Restricted Access         0.08                 1                   0
## 5 Rural Restricted Access         0.08                 1                   0
##   shouldDisplay sourceTypeID HPMSVtypeID sourceTypeName  dayName noOfRealDays
## 1             1           11          10     Motorcycle Weekdays            5
## 2             1           11          10     Motorcycle Weekdays            5
## 3             1           11          10     Motorcycle Weekdays            5
## 4             1           11          10     Motorcycle Weekdays            5
## 5             1           11          10     Motorcycle Weekdays            5
##   HPMSVtypeName
## 1   Motorcycles
## 2   Motorcycles
## 3   Motorcycles
## 4   Motorcycles
## 5   Motorcycles
```

DPLYR

Then you can use DPLYR to make nice summaries:

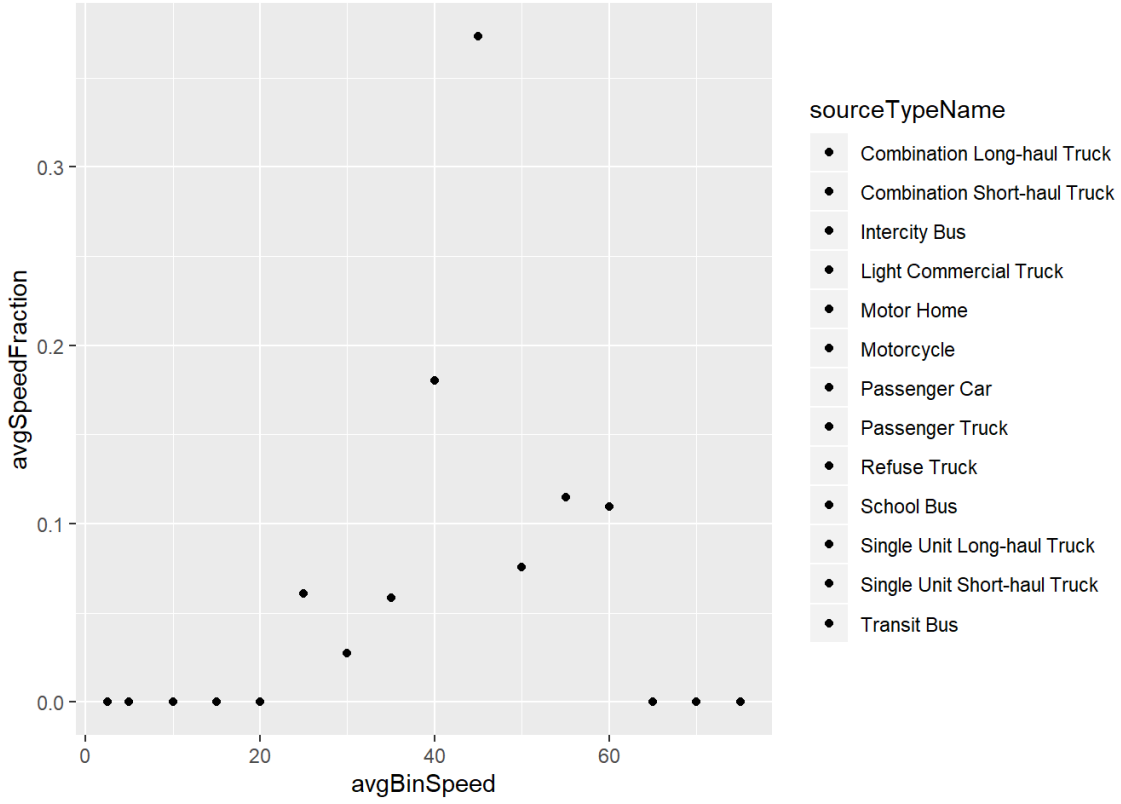
```
data_sub <- data %>%
  filter(dayName == "Weekdays" & roadDesc == "Urban Restricted Access") %>%
  select(avgSpeedFraction, avgSpeedBinID, avgBinSpeed,sourceTypeID, sourceTypeName, hourID)


data_sub <- data_sub %>%
  group_by(avgSpeedBinID, avgBinSpeed, sourceTypeID, sourceTypeName) %>%
  summarize(avgSpeedFraction = mean(avgSpeedFraction))

print(head(data_sub,5))
```

```
## # A tibble: 5 x 5
## # Groups:   avgSpeedBinID, avgBinSpeed, sourceTypeID [5]
##   avgSpeedBinID avgBinSpeed sourceTypeID sourceTypeName         avgSpeedFraction
##           <int>       <dbl>        <int> <chr>                             <dbl>
## 1             1         2.5           11 Motorcycle                            0
## 2             1         2.5           21 Passenger Car                         0
## 3             1         2.5           31 Passenger Truck                       0
## 4             1         2.5           32 Light Commercial Truck                0
## 5             1         2.5           41 Intercity Bus                         0
```

GGPLOT

Then you can use GGPLOT to make nice QA graphs (though this is not that):

```
plot <-  ggplot(data_sub, aes(avgBinSpeed, avgSpeedFraction, fill=sourceTypeName)) +
  geom_point()
plot
```



Create New Test Database

You can then manipulate data to run scenarios:

```
data <- getIMCoverage(dbconn, movesdb_name, countydb_name)
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 55 imported as
## numeric
```

```
print(head(data,2))
```

```
##   yearID inspectFreq IMProgramID begModelYearID endModelYearID useIMyn
## 1   2017           2         111           1968           1983       Y
## 2   2017           2         111           1968           1983       Y
##   complianceFactor polProcessID processID pollutantID isAffectedByExhaustIM
## 1            93.12          101         1           1                     Y
## 2            93.12          102         2           1                     Y
##   isAffectedByEvapIM chainedto1 chainedto2 isAffectedByOnroad
## 1                  N         NA         NA                  1
## 2                  N         NA         NA                  1
##   isAffectedByNonroad nrChainedTo1 nrChainedTo2 stateID            stateName
## 1                   1           NA           NA      11 DISTRICT OF COLUMBIA
## 2                   0           NA           NA      11 DISTRICT OF COLUMBIA
##   stateAbbr countyID           countyName altitude GPAFract barometricPressure
## 1        DC    11001 District of Columbia        L        0             29.739
## 2        DC    11001 District of Columbia        L        0             29.739
##   barometricPressureCV sourceTypeID HPMSVtypeID sourceTypeName fuelTypeID
## 1                   NA           21          25  Passenger Car          1
## 2                   NA           21          25  Passenger Car          1
##   defaultFormulationID fuelTypeDesc humidityCorrectionCoeff
## 1                   10     Gasoline                  0.0038
## 2                   10     Gasoline                  0.0038
##   humidityCorrectionCoeffCV fuelDensity subjectToEvapCalculations
## 1                        NA        2839                        Y
## 2                        NA        2839                        Y
##   testStandardsID  testStandardsDesc     shortName              pollutantName
## 1              11 Unloaded Idle Test Unloaded Idle Total Gaseous Hydrocarbons
## 2              11 Unloaded Idle Test Unloaded Idle Total Gaseous Hydrocarbons
##   energyOrMass globalWarmingPotential NEIPollutantCode pollutantDisplayGroupID
## 1         mass                     NA              HC                      30
## 2         mass                     NA              HC                      30
##       processName SCCProcID occursOnRealRoads processDisplayGroupID
## 1 Running Exhaust         X                 Y                    NA
## 2   Start Exhaust         X                 N                    NA
```

```
newdata <- data[]
newdata$inspectFreq <- 1
print(head(newdata,2))
```

```
##   yearID inspectFreq IMProgramID begModelYearID endModelYearID useIMyn
## 1   2017           1         111           1968           1983       Y
## 2   2017           1         111           1968           1983       Y
##   complianceFactor polProcessID processID pollutantID isAffectedByExhaustIM
## 1            93.12          101         1           1                     Y
## 2            93.12          102         2           1                     Y
##   isAffectedByEvapIM chainedto1 chainedto2 isAffectedByOnroad
## 1                  N         NA         NA                  1
## 2                  N         NA         NA                  1
##   isAffectedByNonroad nrChainedTo1 nrChainedTo2 stateID            stateName
## 1                   1           NA           NA      11 DISTRICT OF COLUMBIA
## 2                   0           NA           NA      11 DISTRICT OF COLUMBIA
##   stateAbbr countyID           countyName altitude GPAFract barometricPressure
## 1        DC    11001 District of Columbia        L        0             29.739
## 2        DC    11001 District of Columbia        L        0             29.739
##   barometricPressureCV sourceTypeID HPMSVtypeID sourceTypeName fuelTypeID
## 1                   NA           21          25  Passenger Car          1
## 2                   NA           21          25  Passenger Car          1
##   defaultFormulationID fuelTypeDesc humidityCorrectionCoeff
## 1                   10     Gasoline                  0.0038
## 2                   10     Gasoline                  0.0038
##   humidityCorrectionCoeffCV fuelDensity subjectToEvapCalculations
## 1                        NA        2839                        Y
## 2                        NA        2839                        Y
##   testStandardsID  testStandardsDesc     shortName              pollutantName
## 1              11 Unloaded Idle Test Unloaded Idle Total Gaseous Hydrocarbons
## 2              11 Unloaded Idle Test Unloaded Idle Total Gaseous Hydrocarbons
##   energyOrMass globalWarmingPotential NEIPollutantCode pollutantDisplayGroupID
## 1         mass                     NA              HC                      30
## 2         mass                     NA              HC                      30
##       processName SCCProcID occursOnRealRoads processDisplayGroupID
## 1 Running Exhaust         X                 Y                    NA
## 2   Start Exhaust         X                 N                    NA
```

```
suffix <- "_scenario1"
new_countydb_name <- paste(countydb_name, suffix, sep="")
#copyMOVESDatabase(dbconn, countydb_name, new_countydb_name)
replaceMOVESTable(dbconn,new_countydb_name, "imcoverage", newdata)
```

Running MOVES - Set Some Variables

Now we are going to run MOVES. You can start by setting some variables. All are needed for option 1 for running MOVES, only the first two are needed for option 2.

```
moves_location <- "C:\\Users\\Public\\EPA\\MOVES\\MOVES2014b"
folder <- input_runspec <- "C:\\Users\\joseph.jakuta\\Desktop\\"
input_runspec <- paste(folder, "test_runspec.xml", sep='')
output_runspec <- paste(folder, "test_runspec_new.mrs", sep='')
batchfile <- paste(folder, "test_batch.bat", sep='')
```

Running MOVES - Maninpulate the RUNSPEC

These functions can get variables (except the description) and set variables (except the description) in the Runspec. These are

```
rs <- readRunspec(input_runspec)
getRunspecAttr(rs, "//scaleinputdatabase", "databasename")
```

```
## [1] "ozn_dc_2017_naaq_in"
```

```
print(rs)
```

```
## <?xml version="1.0"?>
## <runspec version="MOVES2014b-20180726">
##   <description><![CDATA[]]></description>
##   <models>
##     <model value="ONROAD"/>
##   </models>
##   <modelscale value="Inv"/>
##   <modeldomain value="SINGLE"/>
##   <geographicselections>
##     <geographicselection type="COUNTY" key="11001" description="DISTRICT OF COLUMBIA - District of Columbia"/>
##   </geographicselections>
##   <timespan>
##     <year key="2017"/>
##     <month id="1"/>
##     <month id="2"/>
##     <month id="3"/>
##     <month id="4"/>
##     <month id="5"/>
##     <month id="6"/>
##     <month id="7"/>
##     <month id="8"/>
##     <month id="9"/>
##     <month id="10"/>
##     <month id="11"/>
##     <month id="12"/>
##     <day id="2"/>
##     <day id="5"/>
##     <beginhour id="1"/>
##     <endhour id="24"/>
##     <aggregateBy key="Hour"/>
##   </timespan>
##   <onroadvehicleselections>
##     <onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="42" source
typename="Transit Bus"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="62" sourcetypename="Combina
tion Long-haul Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="61" sourcetypename="Combina
tion Short-haul Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="41" sourcetypename="Interci
ty Bus"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="32" sourcetypename="Light C
ommercial Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="54" sourcetypename="Motor H
ome"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="21" sourcetypename="Passeng
er Car"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="31" sourcetypename="Passeng
er Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="51" sourcetypename="Refuse
Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="43" sourcetypename="School
Bus"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="53" sourcetypename="Single
Unit Long-haul Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="52" sourcetypename="Single
Unit Short-haul Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="42" sourcetypename="Transit
Bus"/>
##     <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="32" sourcetypename="Light C
ommercial Truck"/>
##     <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="21" sourcetypename="Passeng
er Car"/>
##     <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="31" sourcetypename="Passeng
```

```
er Truck"/>
##     <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="32" sourcetypename="Ligh
t Commercial Truck"/>
##     <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="21" sourcetypename="Pass
enger Car"/>
##     <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="31" sourcetypename="Pass
enger Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="61" sourcetypename="Combinatio
n Short-haul Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="32" sourcetypename="Light Comm
ercial Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="54" sourcetypename="Motor Hom
e"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="11" sourcetypename="Motorcycl
e"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="21" sourcetypename="Passenger
Car"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="31" sourcetypename="Passenger
Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="51" sourcetypename="Refuse Tru
ck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="43" sourcetypename="School Bu
s"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="53" sourcetypename="Single Uni
t Long-haul Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="52" sourcetypename="Single Uni
t Short-haul Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="42" sourcetypename="Transit Bu
s"/>
##   </onroadvehicleselections>
##   <offroadvehicleselections>
##  </offroadvehicleselections>
##   <offroadvehiclesccs>
##  </offroadvehiclesccs>
##   <roadtypes separateramps="false">
##     <roadtype roadtypeid="1" roadtypename="Off-Network" modelCombination="M1"/>
##     <roadtype roadtypeid="2" roadtypename="Rural Restricted Access" modelCombination="M1"/>
##     <roadtype roadtypeid="3" roadtypename="Rural Unrestricted Access" modelCombination="M1"/>
##     <roadtype roadtypeid="4" roadtypename="Urban Restricted Access" modelCombination="M1"/>
##     <roadtype roadtypeid="5" roadtypename="Urban Unrestricted Access" modelCombination="M1"/>
##   </roadtypes>
##   <pollutantprocessassociations>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="1" proce
ssname="Running Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="2" proce
ssname="Start Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="15" proc
essname="Crankcase Running Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="16" proc
essname="Crankcase Start Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="17" proc
essname="Crankcase Extended Idle Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="90" proc
essname="Extended Idle Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="91" proc
essname="Auxiliary Power Exhaust"/>
##   </pollutantprocessassociations>
##   <databaseselections>
##     <databaseselection servername="" databasename="MOVES2014_early_NLEV" description=""/>
##   </databaseselections>
##   <internalcontrolstrategies>
##     <internalcontrolstrategy classname="gov.epa.otaq.moves.master.implementation.ghg.internalcontrolstrategies.
rateofprogress.RateOfProgressStrategy"><![CDATA[
## useParameters    No
```

```
##
## ]]></internalcontrolstrategy>
##   </internalcontrolstrategies>
##   <inputdatabase servername="" databasename="" description=""/>
##   <uncertaintyparameters uncertaintymodeenabled="false" numberofrunspersimulation="0" numberofsimulations="0"/>
##   <geographicoutputdetail description="COUNTY"/>
##   <outputemissionsbreakdownselection>
##     <modelyear selected="true"/>
##     <fueltype selected="true"/>
##     <fuelsubtype selected="false"/>
##     <emissionprocess selected="true"/>
##     <onroadoffroad selected="true"/>
##     <roadtype selected="true"/>
##     <sourceusetype selected="true"/>
##     <movesvehicletype selected="false"/>
##     <onroadscc selected="true"/>
##     <estimateuncertainty selected="false" numberOfIterations="2" keepSampledData="false" keepIterations="fals
e"/>
##     <sector selected="false"/>
##     <engtechid selected="false"/>
##     <hpclass selected="false"/>
##     <regclassid selected="true"/>
##   </outputemissionsbreakdownselection>
##   <outputdatabase servername="" databasename="ozn_dc_2017_naaq_out" description=""/>
##   <outputtimestep value="Hour"/>
##   <outputvmtdata value="true"/>
##   <outputsho value="true"/>
##   <outputsh value="true"/>
##   <outputshp value="true"/>
##   <outputshidling value="true"/>
##   <outputstarts value="true"/>
##   <outputpopulation value="true"/>
##   <scaleinputdatabase servername="" databasename="ozn_dc_2017_naaq_in" description=""/>
##   <pmsize value="0"/>
##   <outputfactors>
##     <timefactors selected="true" units="Hours"/>
##     <distancefactors selected="true" units="Miles"/>
##     <massfactors selected="true" units="Pounds" energyunits="Million BTU"/>
##   </outputfactors>
##   <savedata>
##  </savedata>
##   <donotexecute>
##  </donotexecute>
##   <generatordatabase shouldsave="false" servername="" databasename="" description=""/>
##   <donotperformfinalaggregation selected="false"/>
##   <lookuptableflags scenarioid="" truncateoutput="true" truncateactivity="true" truncatebaserates="true"/>
## </runspec>
##
```

```
setRunspecAttr(rs, "//outputdatabase", c(databasename =  new_countydb_name))
```

```
## [[1]]
##                    databasename
## "ozn_dc_2017_naaq_in_scenario1"
```

```
print(rs)
```

```
## <?xml version="1.0"?>
## <runspec version="MOVES2014b-20180726">
##   <description><![CDATA[]]></description>
##   <models>
##     <model value="ONROAD"/>
##   </models>
##   <modelscale value="Inv"/>
##   <modeldomain value="SINGLE"/>
##   <geographicselections>
##     <geographicselection type="COUNTY" key="11001" description="DISTRICT OF COLUMBIA - District of Columbia"/>
##   </geographicselections>
##   <timespan>
##     <year key="2017"/>
##     <month id="1"/>
##     <month id="2"/>
##     <month id="3"/>
##     <month id="4"/>
##     <month id="5"/>
##     <month id="6"/>
##     <month id="7"/>
##     <month id="8"/>
##     <month id="9"/>
##     <month id="10"/>
##     <month id="11"/>
##     <month id="12"/>
##     <day id="2"/>
##     <day id="5"/>
##     <beginhour id="1"/>
##     <endhour id="24"/>
##     <aggregateBy key="Hour"/>
##   </timespan>
##   <onroadvehicleselections>
##     <onroadvehicleselection fueltypeid="3" fueltypedesc="Compressed Natural Gas (CNG)" sourcetypeid="42" source
typename="Transit Bus"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="62" sourcetypename="Combina
tion Long-haul Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="61" sourcetypename="Combina
tion Short-haul Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="41" sourcetypename="Interci
ty Bus"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="32" sourcetypename="Light C
ommercial Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="54" sourcetypename="Motor H
ome"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="21" sourcetypename="Passeng
er Car"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="31" sourcetypename="Passeng
er Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="51" sourcetypename="Refuse
Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="43" sourcetypename="School
Bus"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="53" sourcetypename="Single
Unit Long-haul Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="52" sourcetypename="Single
Unit Short-haul Truck"/>
##     <onroadvehicleselection fueltypeid="2" fueltypedesc="Diesel Fuel" sourcetypeid="42" sourcetypename="Transit
Bus"/>
##     <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="32" sourcetypename="Light C
ommercial Truck"/>
##     <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="21" sourcetypename="Passeng
er Car"/>
##     <onroadvehicleselection fueltypeid="9" fueltypedesc="Electricity" sourcetypeid="31" sourcetypename="Passeng
```

```
er Truck"/>
##     <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="32" sourcetypename="Ligh
t Commercial Truck"/>
##     <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="21" sourcetypename="Pass
enger Car"/>
##     <onroadvehicleselection fueltypeid="5" fueltypedesc="Ethanol (E-85)" sourcetypeid="31" sourcetypename="Pass
enger Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="61" sourcetypename="Combinatio
n Short-haul Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="32" sourcetypename="Light Comm
ercial Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="54" sourcetypename="Motor Hom
e"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="11" sourcetypename="Motorcycl
e"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="21" sourcetypename="Passenger
Car"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="31" sourcetypename="Passenger
Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="51" sourcetypename="Refuse Tru
ck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="43" sourcetypename="School Bu
s"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="53" sourcetypename="Single Uni
t Long-haul Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="52" sourcetypename="Single Uni
t Short-haul Truck"/>
##     <onroadvehicleselection fueltypeid="1" fueltypedesc="Gasoline" sourcetypeid="42" sourcetypename="Transit Bu
s"/>
##   </onroadvehicleselections>
##   <offroadvehicleselections>
##  </offroadvehicleselections>
##   <offroadvehiclesccs>
##  </offroadvehiclesccs>
##   <roadtypes separateramps="false">
##     <roadtype roadtypeid="1" roadtypename="Off-Network" modelCombination="M1"/>
##     <roadtype roadtypeid="2" roadtypename="Rural Restricted Access" modelCombination="M1"/>
##     <roadtype roadtypeid="3" roadtypename="Rural Unrestricted Access" modelCombination="M1"/>
##     <roadtype roadtypeid="4" roadtypename="Urban Restricted Access" modelCombination="M1"/>
##     <roadtype roadtypeid="5" roadtypename="Urban Unrestricted Access" modelCombination="M1"/>
##   </roadtypes>
##   <pollutantprocessassociations>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="1" proce
ssname="Running Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="2" proce
ssname="Start Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="15" proc
essname="Crankcase Running Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="16" proc
essname="Crankcase Start Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="17" proc
essname="Crankcase Extended Idle Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="90" proc
essname="Extended Idle Exhaust"/>
##     <pollutantprocessassociation pollutantkey="3" pollutantname="Oxides of Nitrogen (NOx)" processkey="91" proc
essname="Auxiliary Power Exhaust"/>
##   </pollutantprocessassociations>
##   <databaseselections>
##     <databaseselection servername="" databasename="MOVES2014_early_NLEV" description=""/>
##   </databaseselections>
##   <internalcontrolstrategies>
##     <internalcontrolstrategy classname="gov.epa.otaq.moves.master.implementation.ghg.internalcontrolstrategies.
rateofprogress.RateOfProgressStrategy"><![CDATA[
## useParameters    No
```

```
##
## ]]></internalcontrolstrategy>
##   </internalcontrolstrategies>
##   <inputdatabase servername="" databasename="" description=""/>
##   <uncertaintyparameters uncertaintymodeenabled="false" numberofrunspersimulation="0" numberofsimulations="0"/>
##   <geographicoutputdetail description="COUNTY"/>
##   <outputemissionsbreakdownselection>
##     <modelyear selected="true"/>
##     <fueltype selected="true"/>
##     <fuelsubtype selected="false"/>
##     <emissionprocess selected="true"/>
##     <onroadoffroad selected="true"/>
##     <roadtype selected="true"/>
##     <sourceusetype selected="true"/>
##     <movesvehicletype selected="false"/>
##     <onroadscc selected="true"/>
##     <estimateuncertainty selected="false" numberOfIterations="2" keepSampledData="false" keepIterations="fals
e"/>
##     <sector selected="false"/>
##     <engtechid selected="false"/>
##     <hpclass selected="false"/>
##     <regclassid selected="true"/>
##   </outputemissionsbreakdownselection>
##   <outputdatabase databasename="ozn_dc_2017_naaq_in_scenario1"/>
##   <outputtimestep value="Hour"/>
##   <outputvmtdata value="true"/>
##   <outputsho value="true"/>
##   <outputsh value="true"/>
##   <outputshp value="true"/>
##   <outputshidling value="true"/>
##   <outputstarts value="true"/>
##   <outputpopulation value="true"/>
##   <scaleinputdatabase servername="" databasename="ozn_dc_2017_naaq_in" description=""/>
##   <pmsize value="0"/>
##   <outputfactors>
##     <timefactors selected="true" units="Hours"/>
##     <distancefactors selected="true" units="Miles"/>
##     <massfactors selected="true" units="Pounds" energyunits="Million BTU"/>
##   </outputfactors>
##   <savedata>
##  </savedata>
##   <donotexecute>
##  </donotexecute>
##   <generatordatabase shouldsave="false" servername="" databasename="" description=""/>
##   <donotperformfinalaggregation selected="false"/>
##   <lookuptableflags scenarioid="" truncateoutput="true" truncateactivity="true" truncatebaserates="true"/>
## </runspec>
##
```

Running MOVES - Option 1

Three funcitons are needed to run MOVES in the first fashion. This is being discussed mostly to show its available. I suggest using method 2.

```
createTempRunspec(rs, output_runspec)
```

```
## [1] "C:\\Users\\joseph.jakuta\\Desktop\\test_runspec_new.mrs"
```

```
createTempBatchFile(batchfile, c(output_runspec), moves_location)
runMOVES(batchfile)
```

```
##  [1] "Changing to the MOVES folder and compiling code..."
##  [2] "Unable to locate tools.jar. Expected to find it in C:\\Program Files\\Java\\jre1.8.0_201\\lib\\tools.jar"
##  [3] "Buildfile: build.xml"
##  [4] ""
##  [5] "init:"
##  [6] ""
##  [7] "compile:"
##  [8] ""
##  [9] "BUILD SUCCESSFUL"
## [10] "Total time: 0 seconds"
## [11] "Running test_11001_2017_test.mrs"
## [12] "5/21/20 3:13 PM INFO: Loading system configuration..."
## [13] "5/21/20 3:13 PM INFO: System configuration setting up the instance counter..."
## [14] "5/21/20 3:13 PM INFO: System configuration clearing prior IDs..."
## [15] "5/21/20 3:13 PM INFO: System configuration reading computer ID..."
## [16] "5/21/20 3:13 PM INFO: Using master configuration file: MOVESConfiguration.txt"
## [17] "5/21/20 3:13 PM INFO: System configuration loading configuration files..."
## [18] "5/21/20 3:13 PM INFO: System configuration setting up temporary files..."
## [19] "5/21/20 3:13 PM INFO: Folder for temporary files: C:\\Users\\Public\\EPA\\MOVES\\MOVES2014b\\MOVESTempora
ry"
## [20] "5/21/20 3:13 PM INFO: System configuration acquiring distributed master ID..."
## [21] "5/21/20 3:13 PM INFO: Done loading system configuration."
## [22] "5/21/20 3:13 PM INFO: Initializing default database connections..."
## [23] "5/21/20 3:13 PM INFO: Reading default database table definitions..."
## [24] "5/21/20 3:13 PM INFO: Done initializing database connections."
## [25] "5/21/20 3:13 PM WARNING: Invalid OutputDatabase"
## [26] "5/21/20 3:13 PM INFO: ***Starting MOVES run***"
## [27] "5/21/20 3:13 PM INFO: Master Release: MOVES2014b-20180726"
## [28] "5/21/20 3:13 PM INFO: Master Computer ID: DOEE-57KVTQ2"
## [29] "5/21/20 3:13 PM INFO: Master ID: 5934130601082476526"
## [30] "5/21/20 3:13 PM INFO: RunSpec: C:\\Users\\joseph.jakuta\\Desktop\\test_runspec_new.mrs"
## [31] "5/21/20 3:13 PM RUN_ERROR: The output database name can not be blank."
## [32] "MOVESCommandLine after runApplication"
```

Running MOVES - Option 2

You simply need to tell .

```
createTempFilesAndRunMOVES(c(rs), folder, moves_location)
```

```
## [1] "C:\\Users\\joseph.jakuta\\Desktop\\r4moves.bat"
```

```
##  [1] "Changing to the MOVES folder and compiling code..."
##  [2] "Unable to locate tools.jar. Expected to find it in C:\\Program Files\\Java\\jre1.8.0_201\\lib\\tools.jar"
##  [3] "Buildfile: build.xml"
##  [4] ""
##  [5] "init:"
##  [6] ""
##  [7] "compile:"
##  [8] ""
##  [9] "BUILD SUCCESSFUL"
## [10] "Total time: 0 seconds"
## [11] "Running test_11001_2017_test.mrs"
## [12] "5/21/20 3:13 PM INFO: Loading system configuration..."
## [13] "5/21/20 3:13 PM INFO: System configuration setting up the instance counter..."
## [14] "5/21/20 3:13 PM INFO: System configuration clearing prior IDs..."
## [15] "5/21/20 3:13 PM INFO: System configuration reading computer ID..."
## [16] "5/21/20 3:13 PM INFO: Using master configuration file: MOVESConfiguration.txt"
## [17] "5/21/20 3:13 PM INFO: System configuration loading configuration files..."
## [18] "5/21/20 3:13 PM INFO: System configuration setting up temporary files..."
## [19] "5/21/20 3:13 PM INFO: Folder for temporary files: C:\\Users\\Public\\EPA\\MOVES\\MOVES2014b\\MOVESTempora
ry"
## [20] "5/21/20 3:13 PM INFO: System configuration acquiring distributed master ID..."
## [21] "5/21/20 3:13 PM INFO: Done loading system configuration."
## [22] "5/21/20 3:13 PM INFO: Initializing default database connections..."
## [23] "5/21/20 3:13 PM INFO: Reading default database table definitions..."
## [24] "5/21/20 3:13 PM INFO: Done initializing database connections."
## [25] "5/21/20 3:13 PM WARNING: Invalid OutputDatabase"
## [26] "5/21/20 3:13 PM INFO: ***Starting MOVES run***"
## [27] "5/21/20 3:13 PM INFO: Master Release: MOVES2014b-20180726"
## [28] "5/21/20 3:13 PM INFO: Master Computer ID: DOEE-57KVTQ2"
## [29] "5/21/20 3:13 PM INFO: Master ID: 7333704953823684526"
## [30] "5/21/20 3:13 PM INFO: RunSpec: C:\\Users\\joseph.jakuta\\Desktop\\ozn_dc_2017_naaq_in_scenario1.mrs"
## [31] "5/21/20 3:13 PM RUN_ERROR: The output database name can not be blank."
## [32] "MOVESCommandLine after runApplication"
```

Get Output

Get the run data and display.

```
by_or_moves_data_run <- getMOVESRun(dbconn, movesdb_name, outputdb_name)
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 0 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 17 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 21 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 22 imported as
## numeric
```

```
print(by_or_moves_data_run)
```

```
##   MOVESRunID outputTimePeriod timeUnits distanceUnits massUnits energyUnits
## 1          1              Day       day            mi       ton           J
##                                                                                                runSpecFileName
## 1 C:\\MOVES\\MOVES2014b\\Application\\2015_OZONE_SIP\\EMP1_0_0\\INPUT\\Runspec\\2017_NAAQ\\OZN_DC_2017_NAAQ.MRS
##   runSpecDescription runSpecFileDateTime         runDateTime scale
## 1           OZONE DC 2019-08-22 15:58:03 2019-08-22 16:09:07   Inv
##   minutesDuration defaultDatabaseUsed       masterVersion masterComputerID
## 1         33.7629     movesdb20181022 MOVES2014b-20181203         DTP277B1
##        masterIDNumber domain domainCountyID     domainCountyName
## 1 6027708299530886042 SINGLE          11001 District of Columbia
##   domainDatabaseServer  domainDatabaseName expectedDONEFiles retrievedDONEFiles
## 1            localhost OZN_DC_2017_NAAQ_IN               61                61
##   models
## 1 onroad
```

Get the output data and summarize (July only run). Note that even though it isnt't in the the DB the weekdays and weekends of the month are added to the dataframe.

```
by_or_moves_data <- getMOVESOutput(dbconn, movesdb_name, outputdb_name)
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 0 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 1 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 2 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 3 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 4 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 5 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 6 imported as
## numeric
```

```
## Warning in .local(conn, statement, ...): Unsigned INTEGER in col 8 imported as
## numeric
```

```
summary <-by_or_moves_data %>%
  filter(pollutantName %in% c("Carbon Monoxide (CO)","Oxides of Nitrogen (NOx)","Non-Methane Hydrocarbons")) %>%
  group_by(monthName, pollutantName) %>%
  summarise(TotalEmissions = sum(emissionQuant*ifelse(dayID == 2, weekendsInMonth, weekdaysInMonth)))

print(summary)
```

```
## # A tibble: 3 x 3
## # Groups:   monthName [1]
##   monthName pollutantName            TotalEmissions
##   <chr>     <chr>                             <dbl>
## 1 July      Carbon Monoxide (CO)             1154.
## 2 July      Non-Methane Hydrocarbons           76.6
## 3 July      Oxides of Nitrogen (NOx)          118.
```

Close DB Connection

```
endDBConnection(dbconn)
```

```
## Warning: Closing open result sets
```

```
## [1] TRUE
```