PraatR: An architecture for controlling the phonetics software 'Praat' with the R programming language
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1. Motivation

**Common workflow:**
1. measure in acoustics program (e.g. Praat)
2. organize in spreadsheet program (e.g. Excel)
3. analyze in statistics program (e.g. SPSS)

**Problems:**
- if find outlier, inconvenient to go back, check, fix, and re-analyze
- measurement extraction isolated from quantitative modeling
- slower workflow (more clicks, multiple scripting languages)

**Goal:** to conduct entire analysis without switching software

More and more linguists using R (since powerful and free)

Thus, proposed solution: **Bring functionality of Praat into R by having R functions execute Praat scripts**

2. How it works

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PraatR contains definition of core R function: `praat()`
- Pass Praat command as character: `praat("To Formant", ...)`

Inside `praat()`, check against SupportedCommands.txt:
- Determine command type: Create, Modify, Query, Play, etc.

Use shell() / system() to instruct operating system (OS) with:
- path to Praat, path to script, command name, arguments

OS invokes Praat with script, executes requested command:
- If Create or Modify, read input file, execute, save output file
- If Query, capture text written to info window and bring into R

Support for ~2000 pairings of ~100 objects + ~1000 commands
- Command names same as in Praat, reducing learning curve

3. Usage

At top of script, load in Praat/R with one line of code:
```
source(paste(.libPaths(),"/Praat","PraatR.r",sep="/"))
```

Specify 'input' and 'output' file paths:
```
praat("Down to PitchTier", input="C:/sound.Pitch", output="C:/sound.PitchTier")
```

Defaults to not overwriting files; Can easily override if desired:
```
praat("To SpectrumTier (peaks)",input="C:/sound.Lfas", output="C:/sound.SpectrumTier", overwrite=TRUE)
```

Specify arguments by passing as a list:
```
praat("To Intensity...", input=-, output=, arguments=list(100, 0, TRUE))
```

Can save output as text file, short text file, or binary file:
```
praat("Down to PointProcess", input=-, output=-, filetype="binary")
```

Can also modify existing file (replacing original by default):
```
praat("Insert boundary...", input="C:/sound.TextGrid", arguments=list(1, 0.5))
```

Query information from object directly into R:
```
x = praat("Get mean...", input="sound.Formant", arguments=list(1,0,0,"Hzt"))  # [1] "492.38648475717173 Hzt"
```

Trim off all but core numeric information with 'simplify=TRUE':
```
x = praat("Get mean...", input="sound.Formant", arguments=list(1,0,0,"Hzt"),simplify=TRUE)  # [1] "492.38648475717173"
```

Can also use Praat to play audio:
```
praat("Play", input="C:/sound.wav")
```

4. Visualization and interactivity

**Visualization**
Use R's powerful graphics to highlight relevant aspects of signal
- Can help to 'see' the quality of a given measurement

**Example:** rich visualization of F0+intensity ("Anna married Lenny")

**Interactivity**
Use R's locator() and identify() functions of the 'tcltk' package
- Help speed annotation process (Human work minimized)

**Example:** selecting local F0 maxima (Same utterance as above)

5. Conclusion

User empowered to conduct entire analysis in single environment
- No need to manually shuttle data between programs
- More efficient, speeds up analysis

Relatively easy to innovate novel visualization / interactivity
- Building custom programs becomes accessible to many linguists
- Not constrained by one program; possibilities become infinite!

**Where to obtain**
- Installation instructions; documentation of available commands
- Released under GNU General Public License
- Currently supported on Windows and Mac; Linux forthcoming