ABC PLAYER DESIGN DOCUMENT

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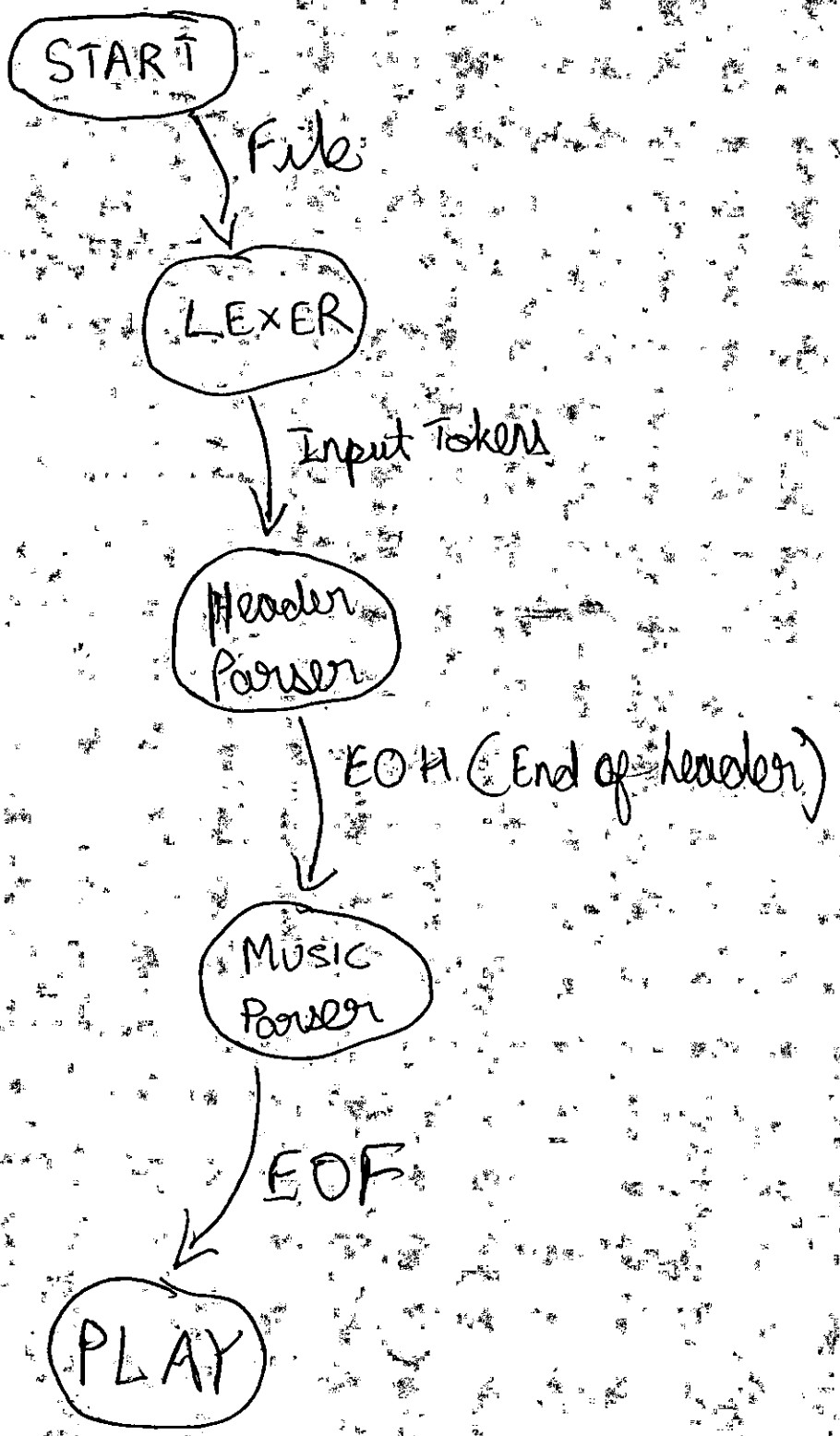
DATATYPES:

```
Pitch = Pitch(value: int,accidental: int,octave: int)
NoteLength = NoteLength(numerator: int,denominator: int)
Note = Note(p: Pitch,l: NoteLength)
Rest = Rest(l: NoteLength)
Tuplet = Duplet(a: Note,b: Note) + Triplet(a: Note,b: Note,c: Note) + Quadruplet(a:
Note,b: Note,c: Note,d: Note)
Chord = Chord(notes: ImList<Note>)
Multinote = Note + Chord
PlayableElement = Tuplet + Multinote + Rest
Measure = Measure(elements: ImList<PlayableElement>,measureID: int,isMajorStart:
boolean,isMajorEnd: boolean,isRepeatEnd: boolean,isFirstRepeat:boolean,
isSecondRepeat: boolean)

isMajorStart should be set to true only for the first Measure in the Voice and for
Measures that start with the following bars: "|:", ":|", "[|", "||", "|]"
isMajorEnd should be set to true only for Measures that end with the same bars
specified above -- repeated for convenience: "|:", ":|", "[|", "||", "|]"
If measure A comes immediately before measure B, then A.isMajorEnd is true iff
B.isMajorStart is true.
isRepeatEnd should be set to true only for Measures that end with the following bars:
":|"
isFirstRepeat should be set to true only for Measures that have the "[1" marker
isSecondRepeat should be set to true only for Measures that have the "[2" marker

KeyMeterTempo = KeyMeterTempo(key: Key, meterNumerator: int, meterDenominator: int,
bpm: int, defaultNoteNumerator: int, defaultNoteDenominator: int)
AbcHeader = AbcHeader(title: String, pieceNumber: int, composer: String, keyMetTempo:
KeyMeterTempo, voices: List<String>)
Key = Key(mask: int, isMinor: boolean) //modifiers is a bitmask containing
information about sharps and flats for all notes: binary representation - xbagfedc -
x is 1 if sharps, 0 if flats; c is 1 if note C has a modifier; d is 1 if note D has a
modifier and so on. Will employ lookup table to translate between key names (e.g.
"Cbm") to bitmasks.

Specification of bitmask configuration in Key:
Field = 0byxx
    y - SHARP_OFFSET: 0 if flats, 1 if sharps
   xx - MAGNITUDE_MASK: 00 if magnitude 0, 01 if magnitude 1, 11 if magnitude 2. 10
is an invalid value.
 Mask = right to left in 0b, C field + D field + E field + ... + B field

Voice = Voice(name: String, measures: List<Measure>)
AbcMusic = AbcMusic(ticksPerUnit: int, voices: HashMap<String, Voice>)
AbcFile = AbcFile(header: AbcHeader,music: AbcMusic)
```

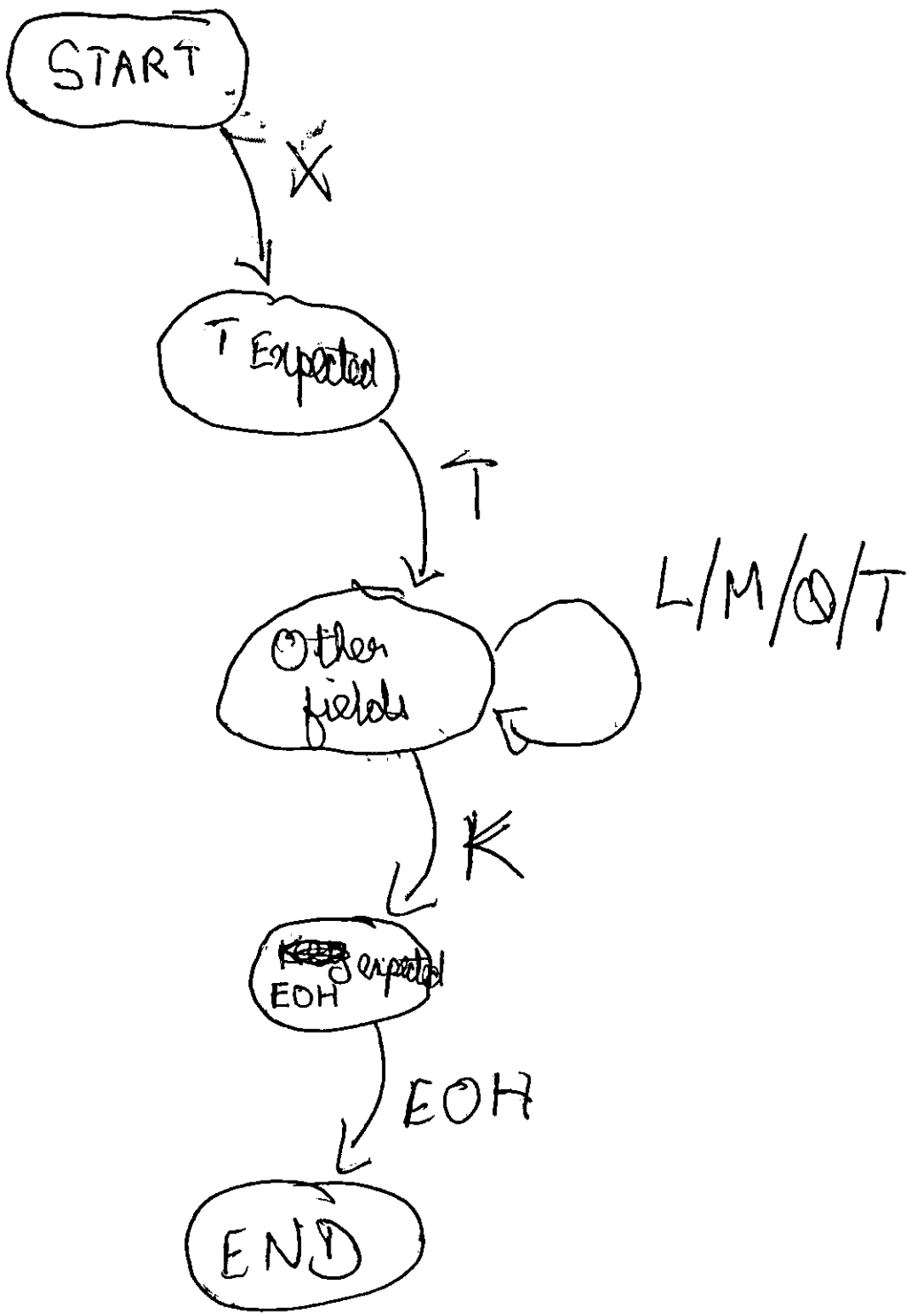
GRAMMARS:

A subset of ABC 1.6 in BNF format for 6.005 Project 1

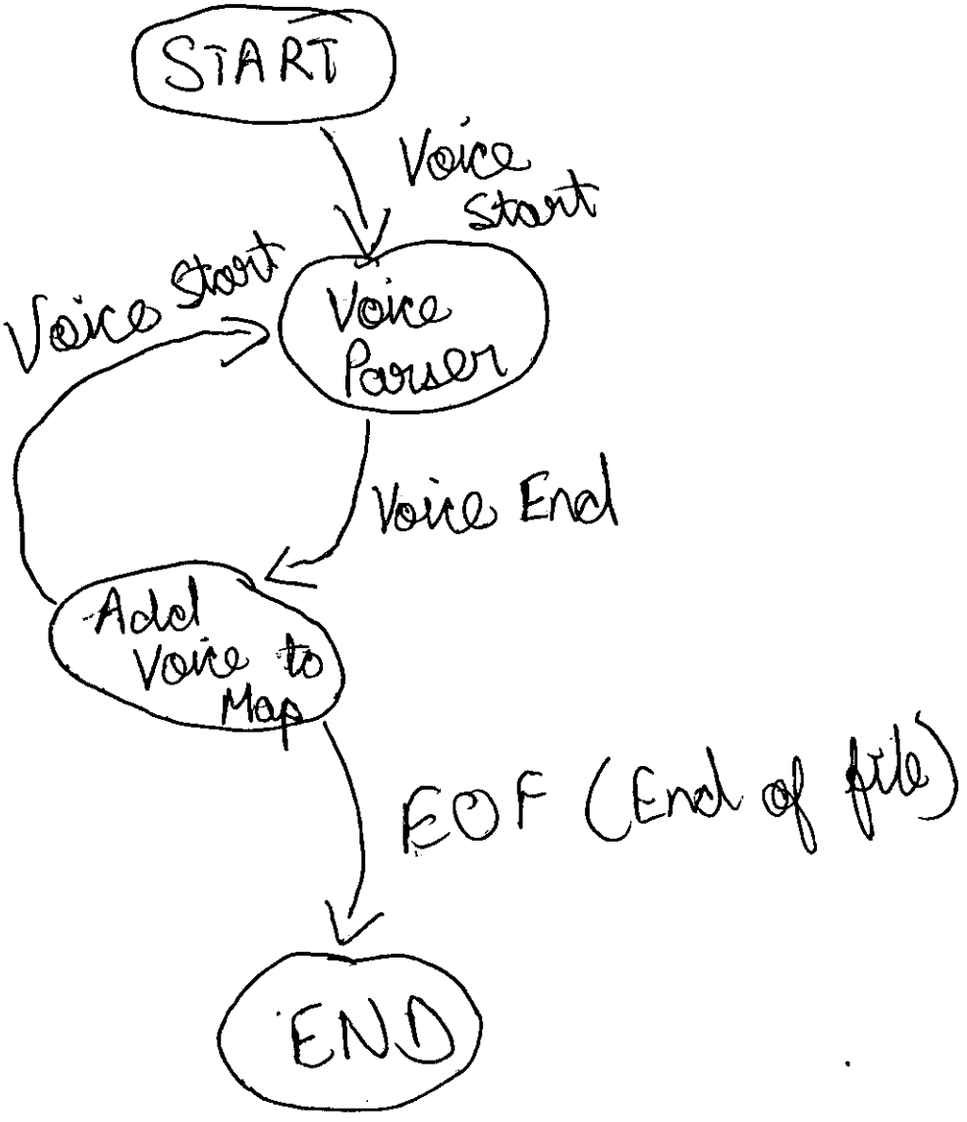
```
abc-file ::= abc-header abc-music
abc-header ::= field-number comment* field-title other-fields* field-key
field-title ::= "T:" text end-of-line
other-fields ::= field-composer | field-default-length | field-meter
      | field-tempo | field-voice | comment
field-composer ::= "C:" text end-of-line
field-default-length ::= "L:" note-length-strict end-of-line
field-meter ::= "M:" meter end-of-line
field-tempo ::= "Q:" tempo end-of-line
field-voice ::= "V:" text end-of-line
field-key ::= "K:" key end-of-line
field-number ::= "X:" key end-of-line
key ::= "C" | "G" | "D" | "A" | "E" | "B" | "F#" | "C#" | "F" | "Bb" | "Eb"
      | "Ab" | "Db" | "Gb" | "Cb" | "Em" | "Bm" | "F#m" | "C#m" | "G#m" | "D#m"
      | "A#m" | "Dm" | "Gm" | "Cm" | "Fm" | "Bbm" | "Ebm" | "Abm"
meter ::= "C" | "C|" | meter-fraction
meter-fraction ::= DIGIT+ "/" DIGIT+
tempo ::= DIGIT+

;;;;;;;;; END OF HEADER ;;;;;;;;;

abc-music ::= abc-line+
abc-line ::= (measure* end-measure end-of-line) | mid-tune-field | comment
end-measure ::= measure ::= [barline] [space+] [nth-repeat] [space+] playable-
element+ [space+] [barline]
measure ::= [barline] [space+] [nth-repeat] [space+] playable-element+ [space+]
barline
playable-element ::= note | chord | tuplet-element
note ::= note-or-rest [note-length]
note-or-rest ::= pitch | rest
pitch ::= [accidental] basenote [octave]
octave ::= ("'"+) | (","+)
note-length ::= [DIGIT+] ["/" [DIGIT+]]
note-length-strict ::= DIGIT+ "/" DIGIT+
accidental ::= "^" | "^^" | "_" | "__" | "="
basenote ::= "C" | "D" | "E" | "F" | "G" | "A" | "B"
       | "c" | "d" | "e" | "f" | "g" | "a" | "b"
rest ::= "z"
tuplet-element ::= tuplet-spec (note | chord)+
tuplet-spec ::= "(" DIGIT
chord ::= "[" note+ "]"
barline ::= "|" | "||" | "[|" | "|]" | ":|" | "|:"
nth-repeat ::= "[1" | "[2"
;;;;;;;;;;;;;;; MISC ;;;;;;;;;;;;;;;
mid-tune-field- ::= field-voice | field-tempo
comment ::= "%" text linefeed
end-of-line ::= comment | linefeed
```


START
File
LEXER
Input Tokens
Header Parser
EOH (End of header)
Music Parser
EOF
PLAY

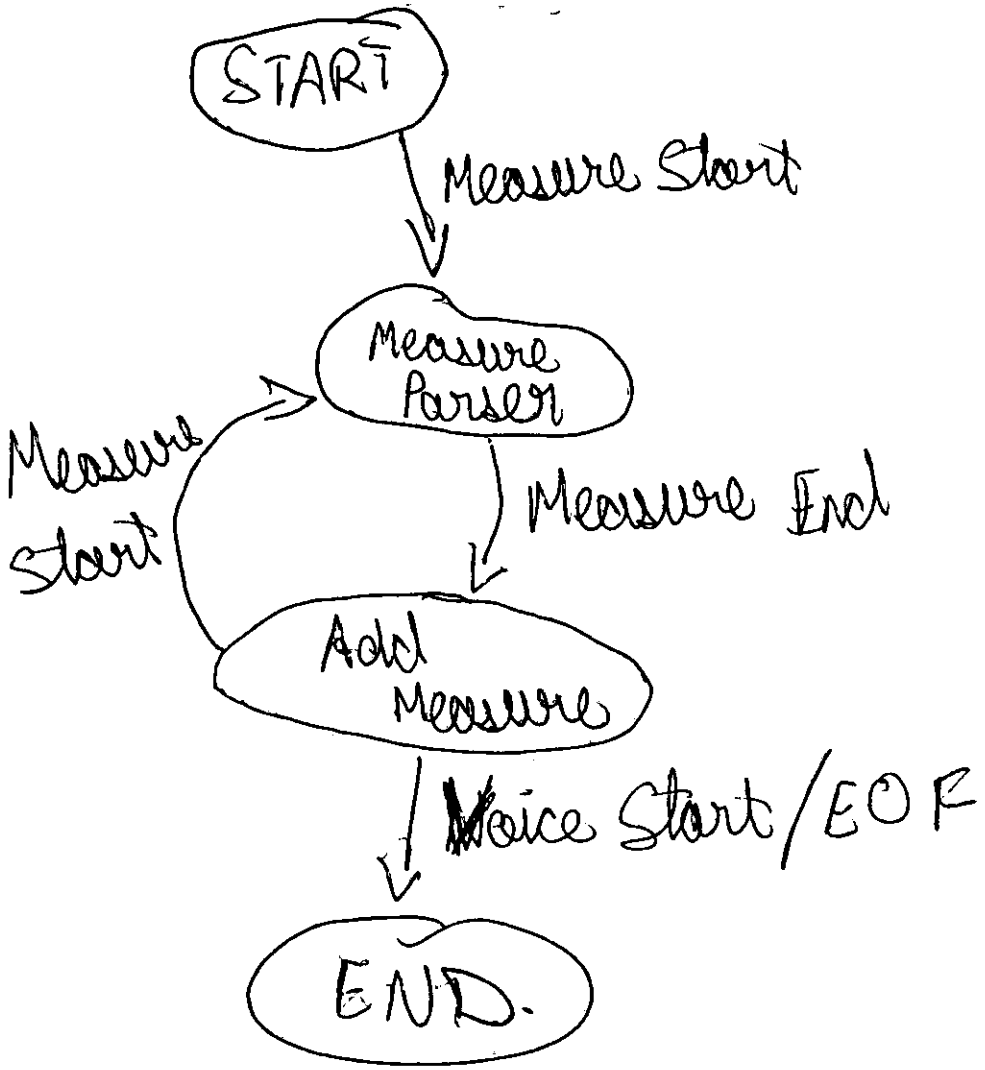
HEADER PARSER



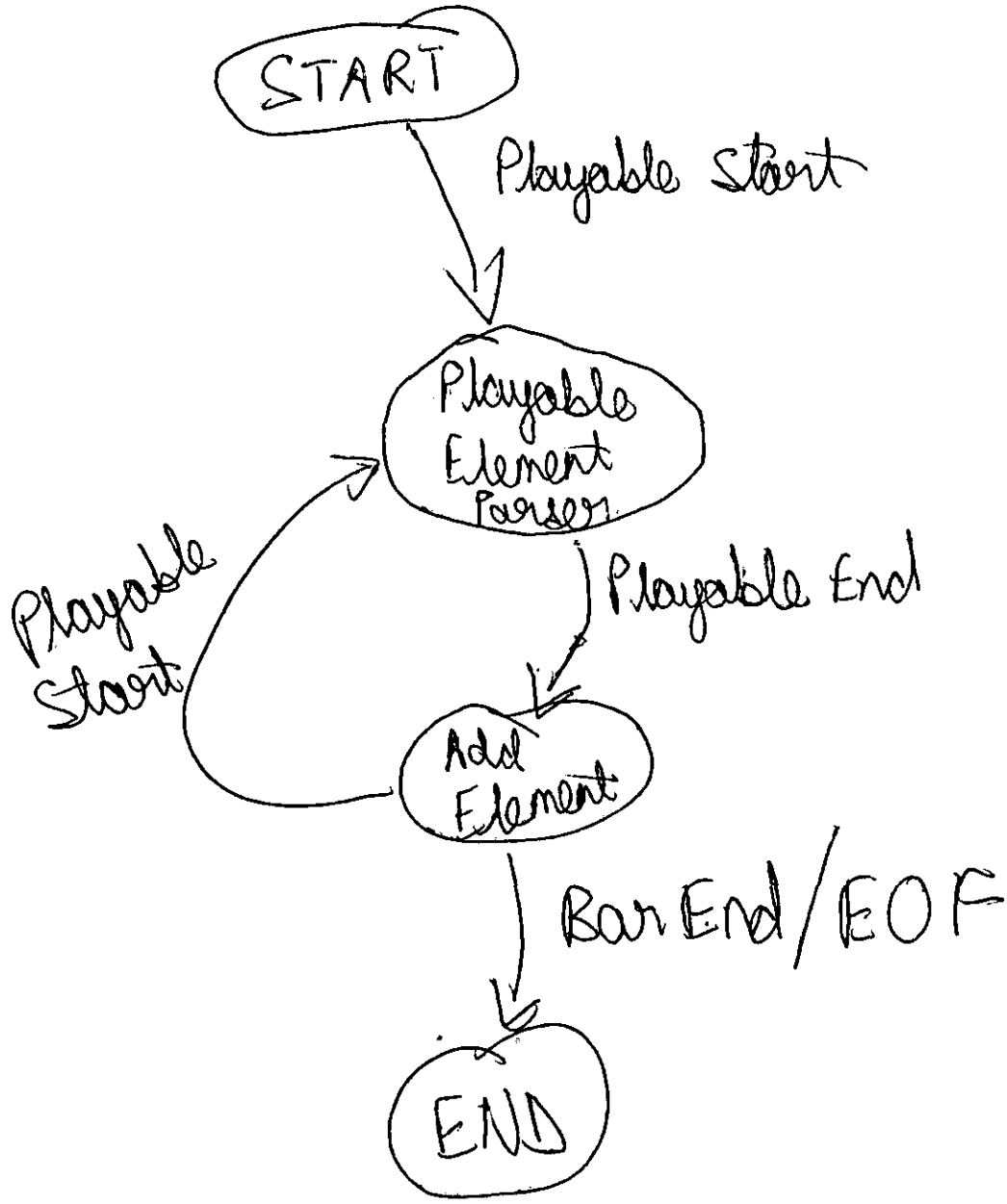
MUSIC PARSER



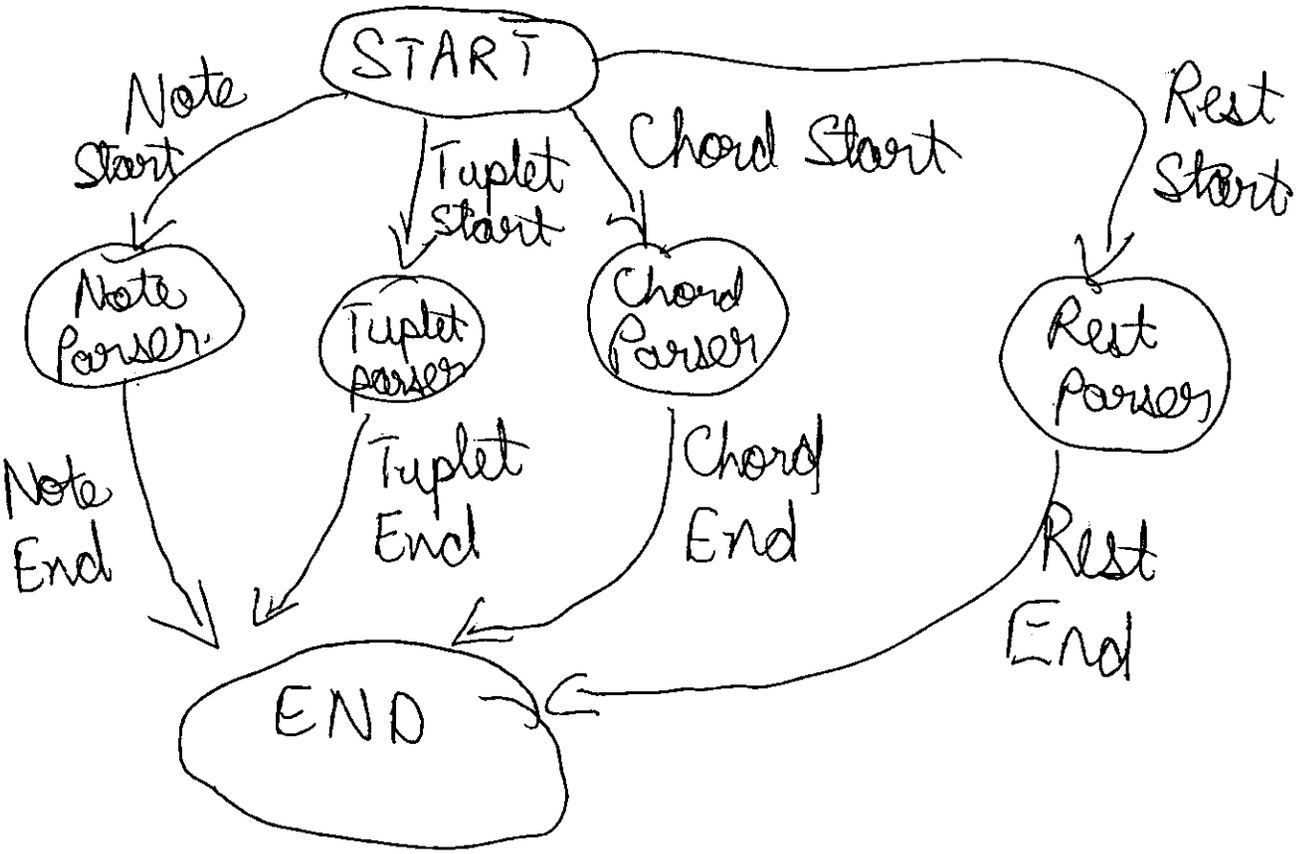
VOICE PARSER



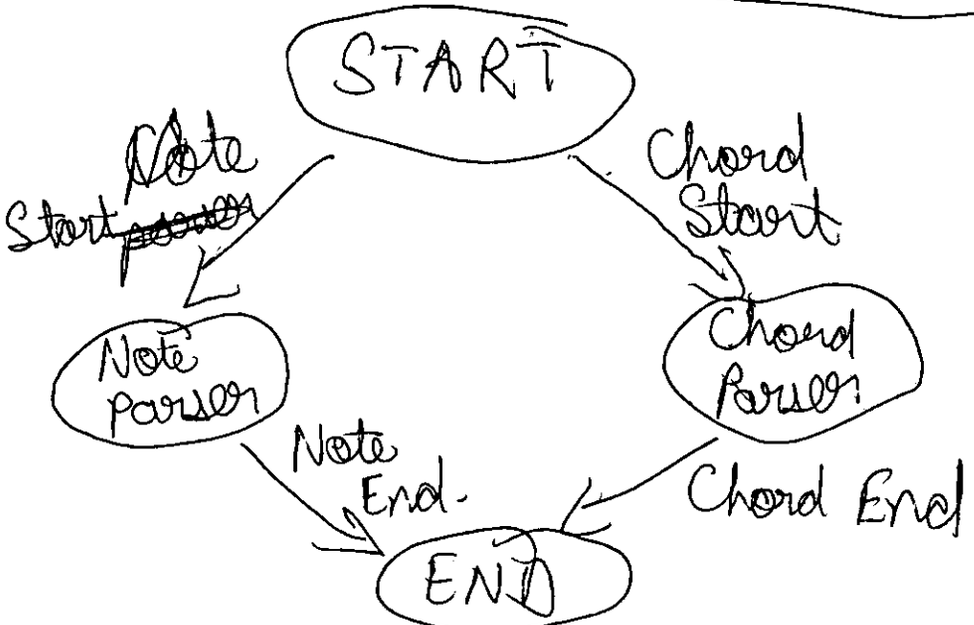
MEASURE PARSER



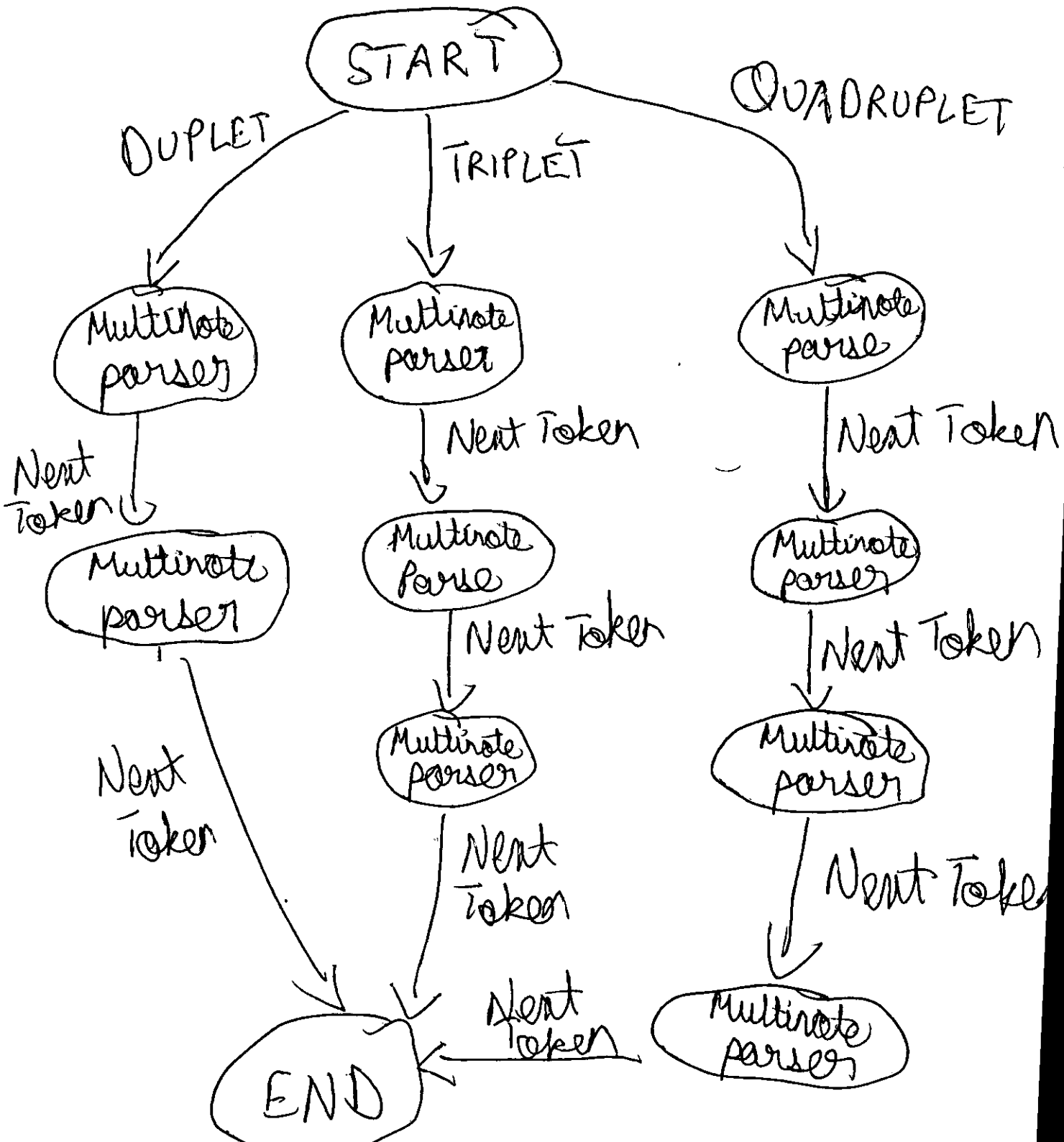
PLAYABLE PARSER



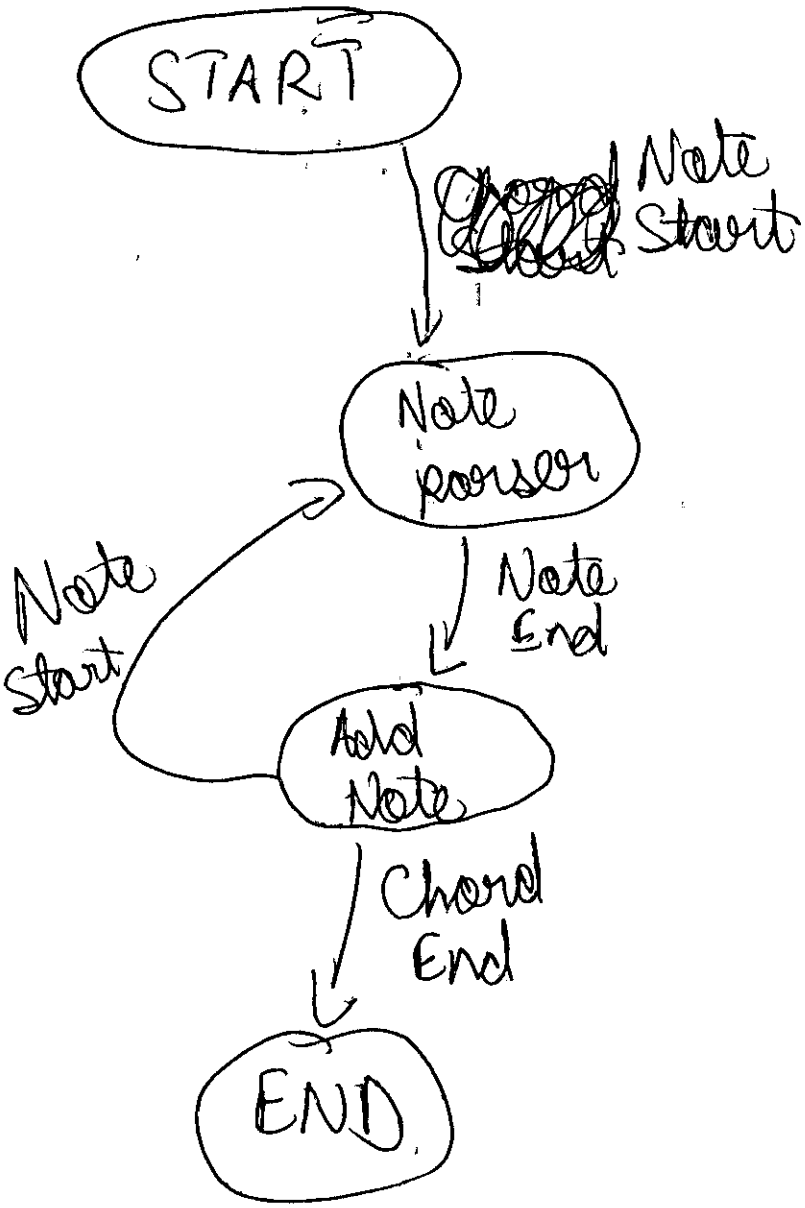
MULTINOTE PARSER



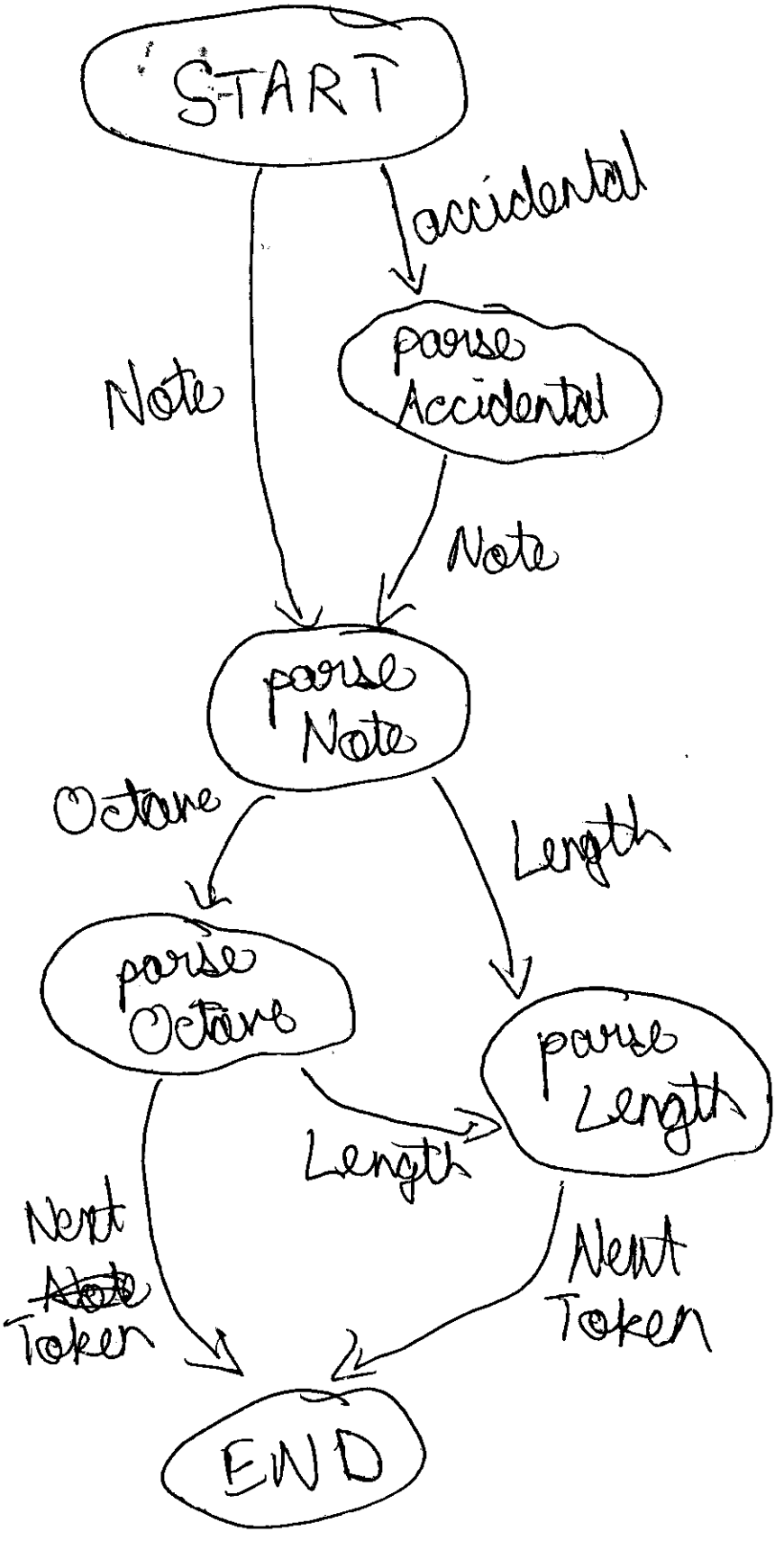
TUPLET PARSER



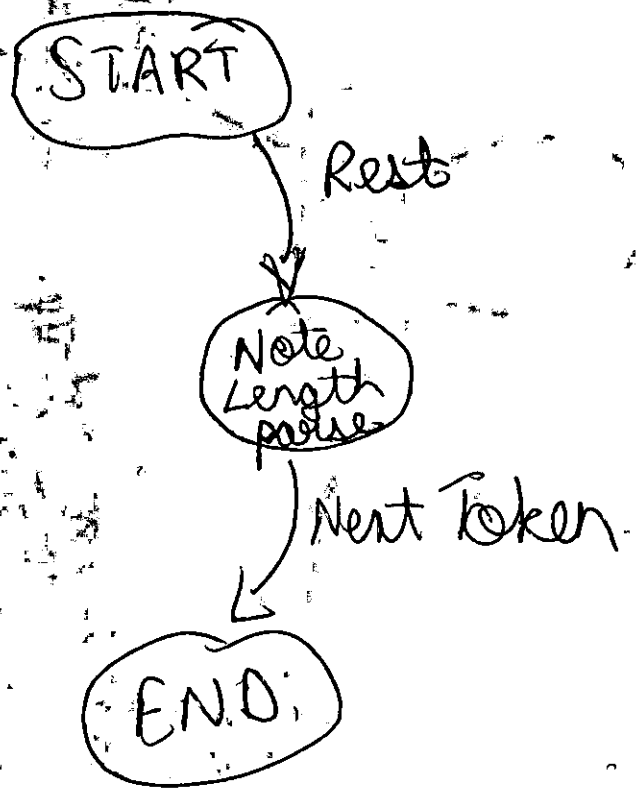
CHORD PARSER



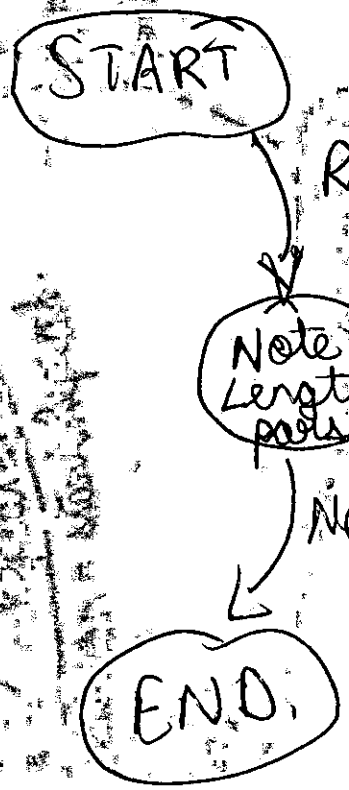
NOTE PARSER


START
accidental
Note
parse Accidental
Note
parse Note
Octave
Length
parse Octave
parse Length
Length
Next ~~Note~~ Token
Next Token
END

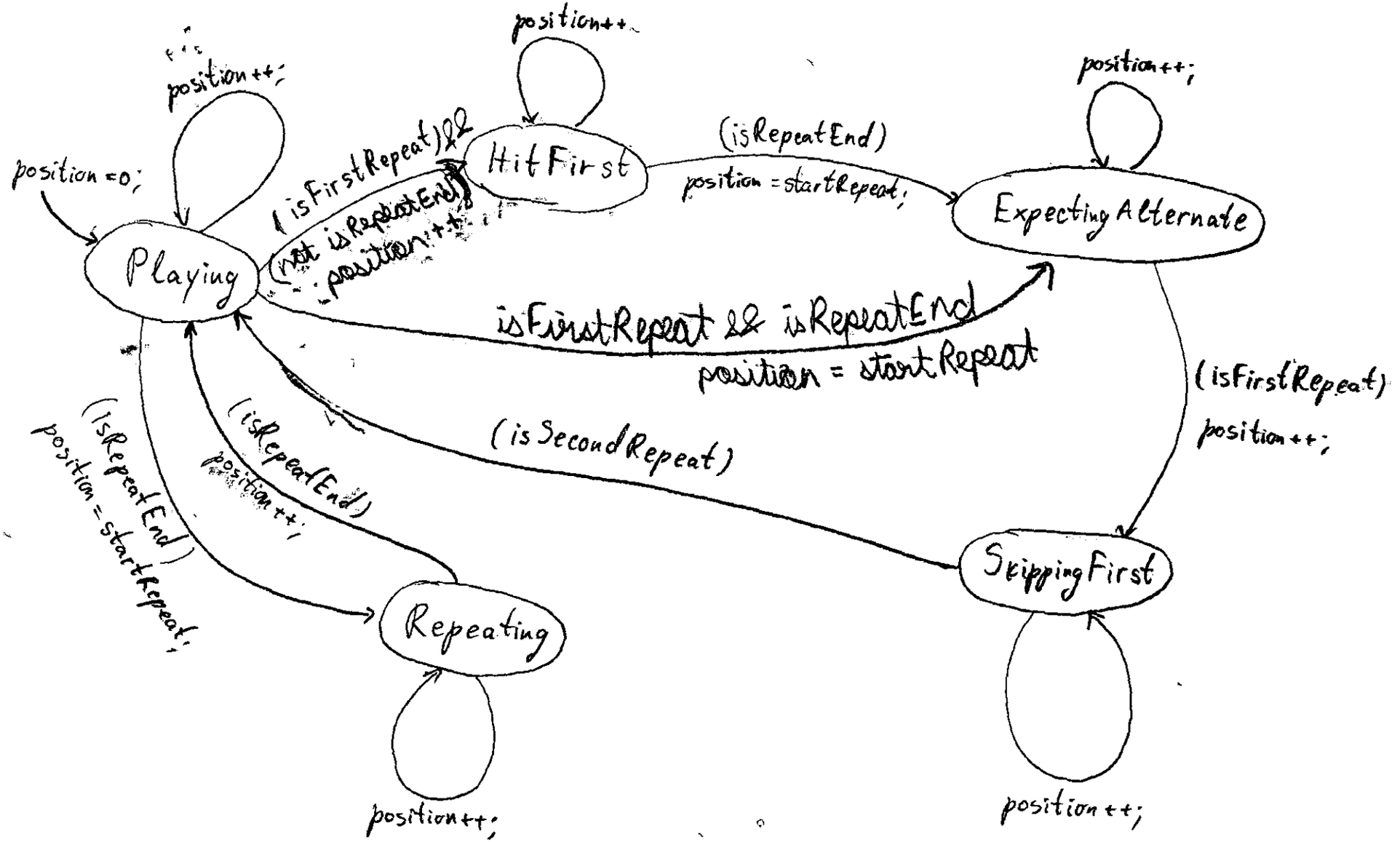
REST PARSER

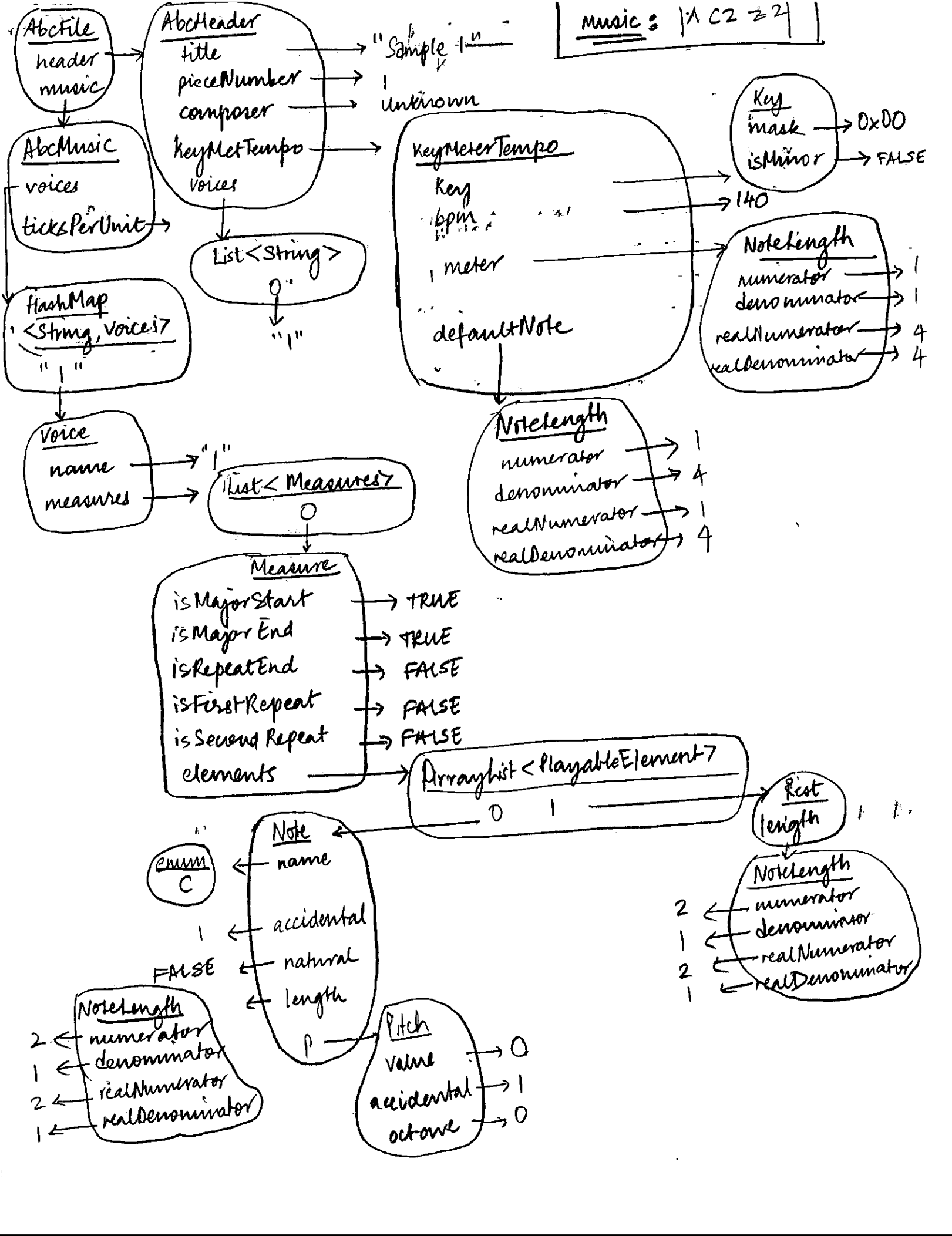


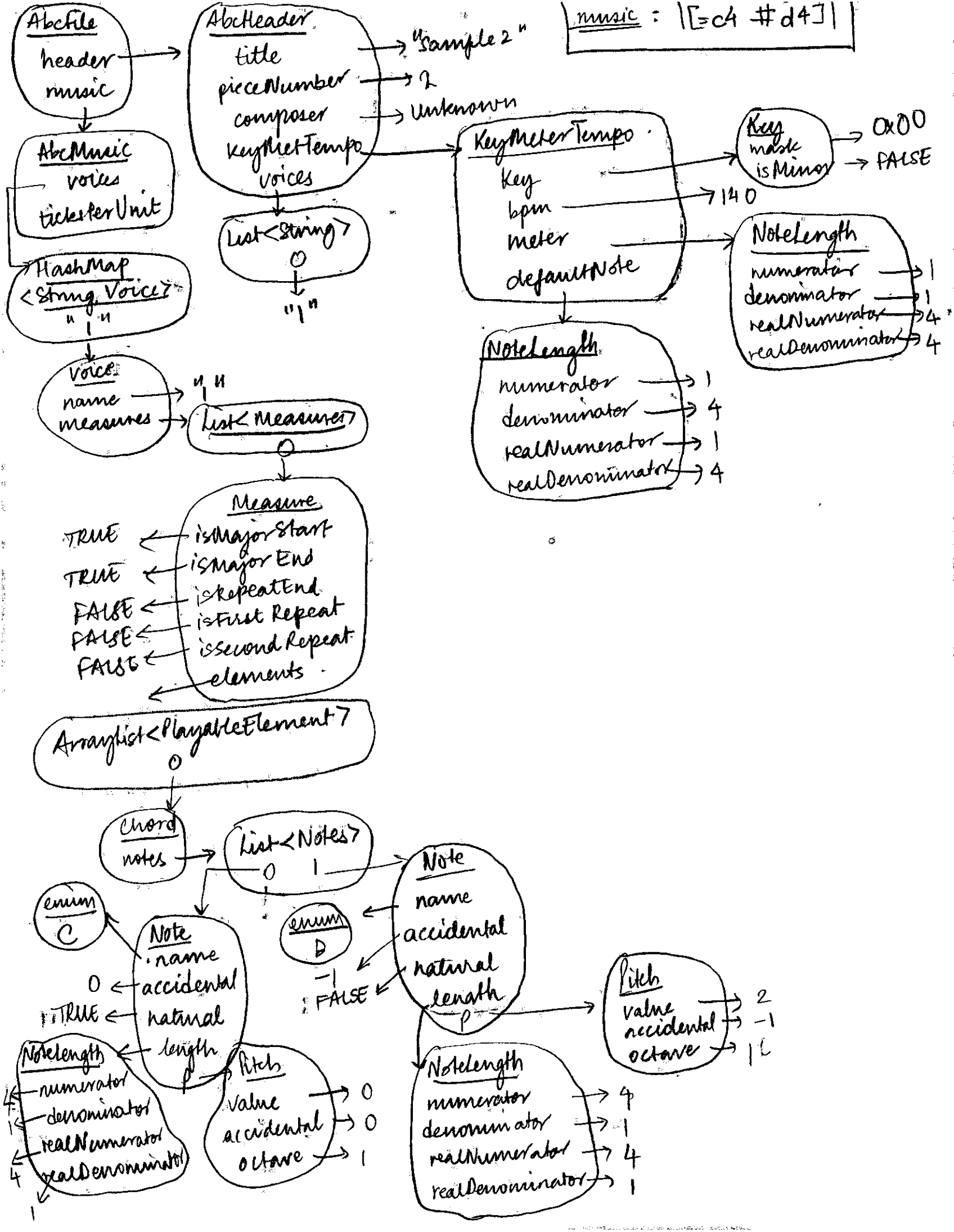
REST PARSER



Voice.play() State Machine




AbcFile
header
music
AbcHeader
title
pieceNumber
composer
keyMetTempo
voices
"Sample 1"
1
unknown
music: |A C2 =2|
AbcMusic
voices
ticksPerUnit
Key
mask
isMinor
0x00
FALSE
KeyMeterTempo
Key
bpm
meter
defaultNote
140
List<String>
0
"1"
NoteLength
numerator
denominator
realNumerator
realDenominator
1
1
4
4
HashMap
<String, Voice>
"1"
Voice
name
measures
"1"
List<Measure>
0
NoteLength
numerator
denominator
realNumerator
realDenominator
1
4
1
4
Measure
isMajorStart
isMajorEnd
isRepeatEnd
isFirstRepeat
isSecondRepeat
elements
TRUE
TRUE
FALSE
FALSE
FALSE
ArrayList<PlayableElement>
0
1
Rest
length
NoteLength
numerator
denominator
realNumerator
realDenominator
2
1
2
1
Note
name
accidental
natural
length
p
1
FALSE
enum
C
NoteLength
numerator
denominator
realNumerator
realDenominator
2
1
2
1
Pitch
value
accidental
octave
0
1
0


music : |[=c4 #d4]|
AbcFile
header
music
AbcHeader
title
pieceNumber
composer
keyMeterTempo
voices
"Sample 2"
2
Unknown
AbcMusic
voices
tickesPerUnit
List<String>
0
"1"
KeyMeterTempo
key
bpm
meter
defaultNote
140
Key
mode
isMinor
0x00
FALSE
NoteLength
numerator
denominator
realNumerator
realDenominator
1
1
4
4
HashMap
<String, Voice>
"1"
Voice
name
measures
"1"
List<Measure>
0
Measure
isMajorStart
isMajorEnd
isRepeatEnd
isFirstRepeat
isSecondRepeat
elements
TRUE
TRUE
FALSE
FALSE
FALSE
ArrayList<PlayableElement>
0
Chord
notes
List<Notes>
0 1
Note
name
accidental
natural
length
enum
C
enum
D
-1
FALSE
0
TRUE
NoteLength
numerator
denominator
realNumerator
realDenominator
4
1
4
1
Pitch
value
accidental
octave
0
0
1
Pitch
value
accidental
octave
2
-1
1
NoteLength
numerator
denominator
realNumerator
realDenominator
4
1
4
1