

# LL(1) Parsing Example: Algebraic Chess Notation

Ranks: horizontal Rows 1-8

Files: Columns a-g

white.  
Rook captures e7

game  $\rightarrow$  s SL

s  $\rightarrow$  R' m r

r  $\rightarrow$  m

$\rightarrow$   $\lambda$

SL  $\rightarrow$  s SL

$\rightarrow$   $\lambda$

m  $\rightarrow$  P<sub>w</sub>

$\rightarrow$  Fx

w  $\rightarrow$  FRc

$\rightarrow$  'x' FRc

x  $\rightarrow$  Rc

$\rightarrow$  'x' FRc

c  $\rightarrow$  '+'

$\rightarrow$  '#'

$\rightarrow$   $\lambda$

R  $\rightarrow$  '0'...'9'

F  $\rightarrow$  'a'...'h'

P  $\rightarrow$  'K'/'Q'/'N'/'R'/'B'

Examples 1:

Not  
tokenized

1. Rxe7 Kh5  $\rightarrow$  Black King moves to h5  
2. Rh7#  $\rightarrow$  White rook moves h7 check mate

Example 2: Fool's mate

not

tokenized

1. f3 e4  
2. g4 Qh4#

FIRST(A) = {t | A  $\rightarrow$  t $\alpha$ }  $\cup$   
{ $\lambda$  | A  $\rightarrow$   $\lambda$ }

FOLLOW(X) = {t | S  $\rightarrow$   $\beta$ Xt $\delta$ }

Build Parse Table:

- For each rule  $A \rightarrow \alpha$ , what is the first terminal you see in  $\alpha$ ?  
for each  $t \in \text{FIRST}(\alpha)$ ,  $T(A, t) = \alpha$ .
- if  $\alpha$  reduces to  $\lambda$ , what terminal may follow?  
for each  $t \in \text{FOLLOW}(A)$ ,  $T(A, t) = \lambda$

Consider: game  $\rightarrow$  s SL, the first terminal I see is R, so  $T[\text{game}, R] = \text{s SL}$ .  
Look at each alternative independently. Consider  $r \rightarrow m$ ?  $\text{FIRST}(m) = \{P, F\}$ .

EOF

$T[m, P] = m$ ,  $T[m, F] = m$ .

Consider  $r \rightarrow \lambda$ ?

$\text{FOLLOW}(r) = \{\$, R\}$

Non terminal	R	F	P	'+'	'#'	'x'	./	\$
game	s SL							
s	R' m r							
r	$\lambda$	m	m					$\lambda$
SL	s SL							$\lambda$
m		Fx	P <sub>w</sub>					
w		FRc						
x						'x' FRc		
c	Rc					'x' FRc		
	$\lambda$	$\lambda$	$\lambda$	'+'	'#'			$\lambda$

# Fools make parse

Stack	String	Action
qme\$	R. FR FR R. FR PFR #	s SL
SSL\$	R. FR FR R. FR PFR #	R! m r
R. m r SL\$	R. FR FR R. FR PFR #	pop/consume
. m r SL\$	. FR FR R. FR PFR #	p/c
m r SL\$	FR FR R. FR PFR #	Fx
Fx r SL\$	FR FR R. FR PFR #	p/c
x r SL\$	FR FR R. FR PFR #	Rc
Rc r SL\$	R FR R. FR PFR #	p/c
cr SL\$	FR R. FR PFR #	λ
r SL\$	FR R. FR PFR #	m
m SL\$	FR R. FR PFR #	Fx
Fx SL\$	FR R. FR PFR #	p/c
x SL\$	R R. FR PFR #	Rc
Rc SL\$	R R. FR PFR #	p/c
c SL\$	R. FR PFR #	λ
SL\$	R. FR PFR #	s SL
s SL\$	R. FR PFR #	R. m r
R. m r SL\$	R. FR PFR #	p/c p/c
m r SL\$	FR PFR #	Fx
Fx r SL\$	FR PFR #	p/c
x r SL\$	R PFR #	Rc
Rc r SL\$	R PFR #	p/c
cr SL\$	PFR #	λ
r SL\$	PFR #	m
m SL\$	PFR #	p/c
Pw SL\$	FR #	FRC
w SL\$	FR #	p/c p/c
FRc SL\$	#	#
c SL\$	#	p/c
# SL\$	#	λ
SL\$	#	λ
\$	\$	ACCEPT