## Formal Definition of Left

First write  $U \xrightarrow{1+} B_1 \cdots B_n$  if U can produce the string  $B_1 \cdots B_n$  using one or more productions. We define, for each non-terminal U in the grammar, the set Left(U) to consist of those symbols

that can start strings derived from U. I.e. If  $U \xrightarrow{1+} B_1 \cdots B_n$  then  $B_1$  is in Left(U). Left(U) can be derived for all non-terminals in the grammar by the following algorithm:

- 1. Initialise all sets Left(U) to empty.
- 2. For each production  $U \longrightarrow B_1 \cdots B_n$  enter  $B_1$  into Left(U).
- 3. For each production  $U \longrightarrow B_1 \cdots B_n$  where  $B_1$  is also a non-terminal enter all the elements of  $Left(B_1)$  into Left(U)
- 4. Repeat 3. until no further change.