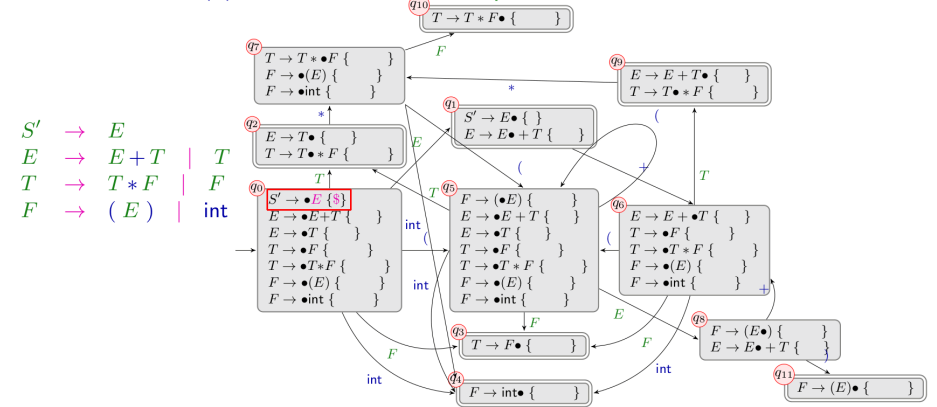## Script generated by TTT

Title: Petter: Compiler Construction (04.06.2020)
- Canonical LR(1) Construction Example

Date: Wed May 27 09:21:28 CEST 2020
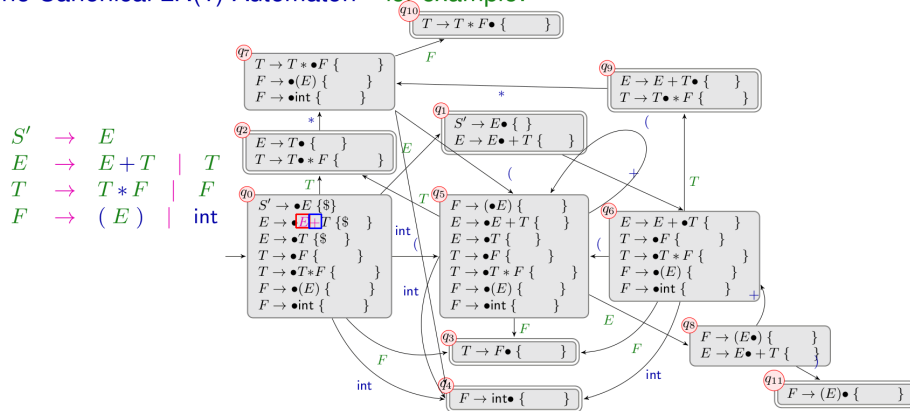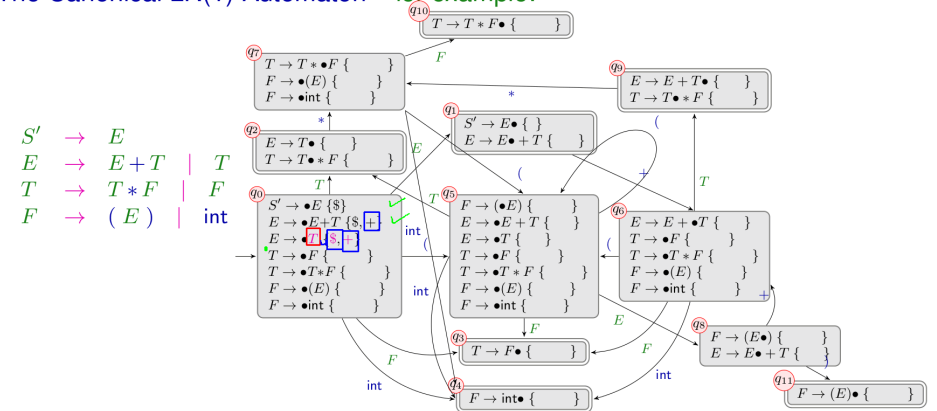
Duration: 24:03 min

Pages: 11

The Canonical LR(1)-Automaton – for example:

$$S' \to E$$
$$E \to E+T \mid T$$
$$T \to T*F \mid F$$
$$F \to (E) \mid \text{int}$$

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q_{10} $T \to T * F \bullet \{\quad\}$

q_7
$T \to T * \bullet F \{\quad\}$
$F \to \bullet (E) \{\quad\}$
$F \to \bullet \text{int} \{\quad\}$

q_9
$E \to E + T \bullet \{\quad\}$
$T \to T \bullet * F \{\quad\}$

q_2
$E \to T \bullet \{\quad\}$
$T \to T \bullet * F \{\quad\}$

q_1
$S' \to E \bullet \{\}$
$E \to E \bullet + T \{\quad\}$

$S' \to E$
$E \to E + T \mid T$
$T \to T * F \mid F$
$F \to (E) \mid \text{int}$

q_0
$S' \to \bullet E \{\$\}$
$E \to \bullet E + T \{\$, +\}$
$E \to \bullet T \{\$, +\}$
$T \to \bullet F \{\$, +\}$
$T \to \bullet T * F \{\$, +\}$
$F \to \bullet (E) \{\quad\}$
$F \to \bullet \text{int} \{\quad\}$

q_5
$F \to (\bullet E) \{\quad\}$
$E \to \bullet E + T \{\quad\}$
$E \to \bullet T \{\quad\}$
$T \to \bullet F \{\quad\}$
$T \to \bullet T * F \{\quad\}$
$F \to \bullet (E) \{\quad\}$
$F \to \bullet \text{int} \{\quad\}$

q_6
$E \to E + \bullet T \{\quad\}$
$T \to \bullet F \{\quad\}$
$T \to \bullet T * F \{\quad\}$
$F \to \bullet (E) \{\quad\}$
$F \to \bullet \text{int} \{\quad\}$

q_3
$T \to F \bullet \{\quad\}$

q_8
$F \to (E \bullet) \{\quad\}$
$E \to E \bullet + T \{\quad\}$

q_4
$F \to \text{int} \bullet \{\quad\}$

q_{11}
$F \to (E) \bullet \{\quad\}$

$$S' \rightarrow E$$
$$E \rightarrow E + T \mid T$$
$$T \rightarrow T * F \mid F$$
$$F \rightarrow (\ E\ ) \mid \text{int}$$

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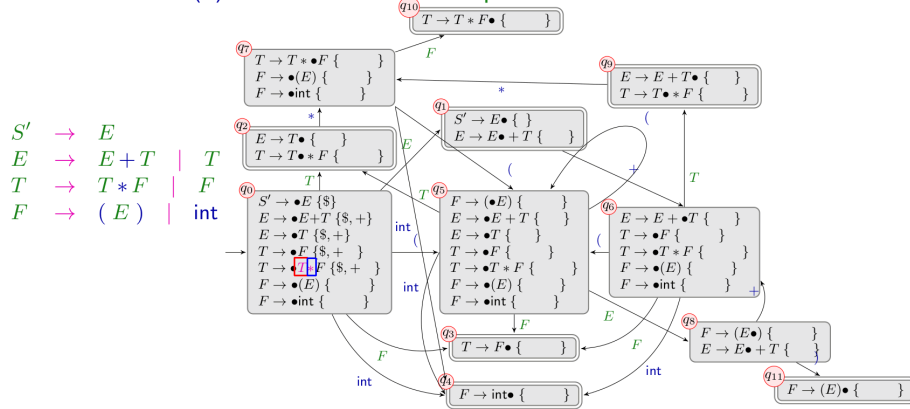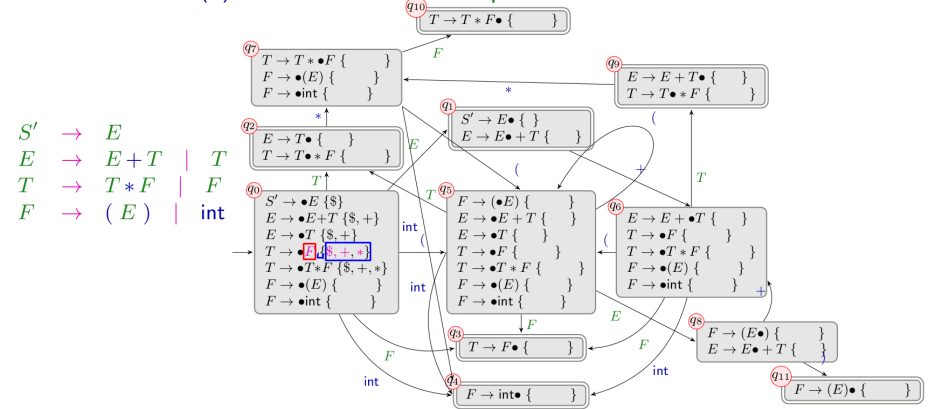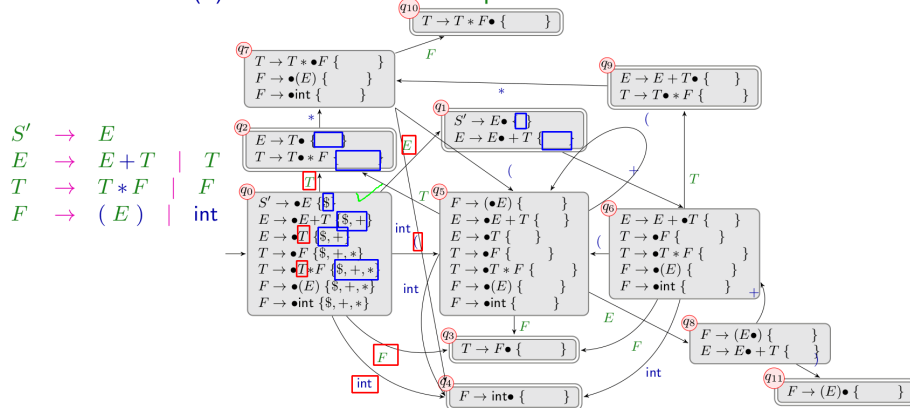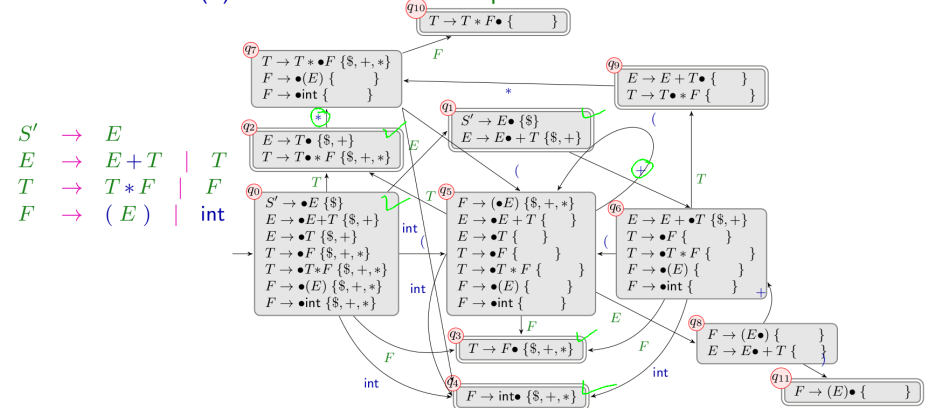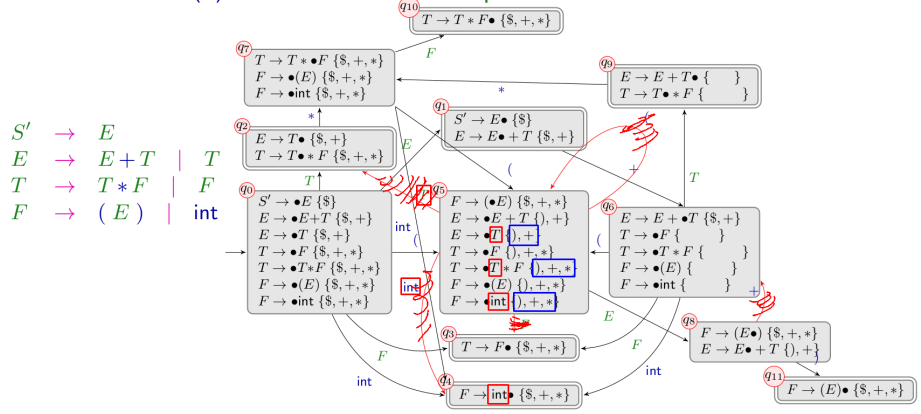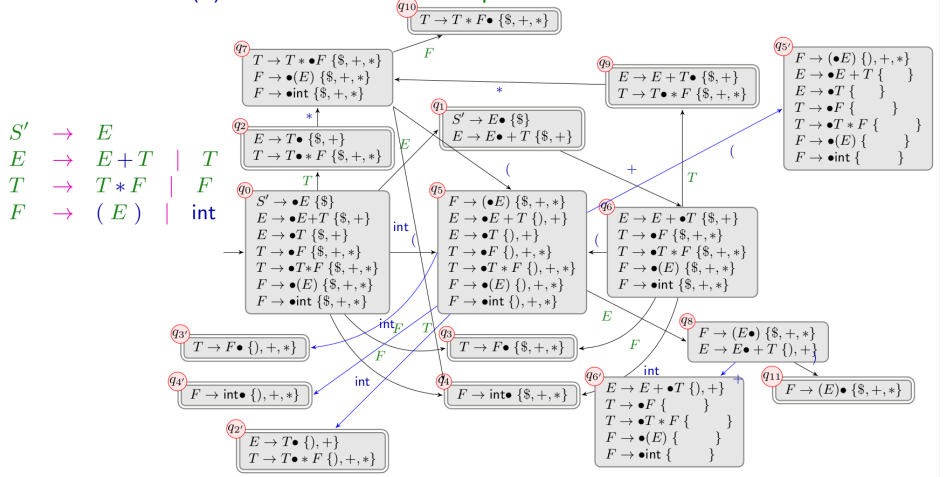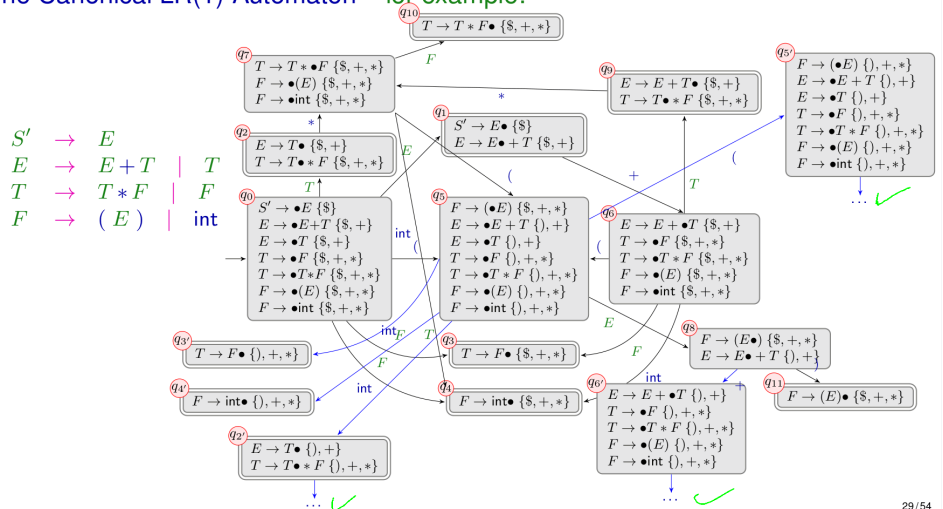
The Canonical LR(1)-Automaton

Discussion:

- In the example, the number of states was almost doubled

  ... and it can become even worse

- The conflicts in states q_1, q_2, q_9 are now resolved !
  e.g. we have:

  q_9

  $$E \rightarrow E + T \bullet \quad \{\$, +\}$$
  $$T \rightarrow T \bullet * F \quad \{\$, +, *\}$$

  with:

  $$\{\$, +\} \cap (\text{First}_1(* F) \odot_1 \{\$, +, *\}) = \{\$, +\} \cap \{*\} = \emptyset$$