

CYCLOPS

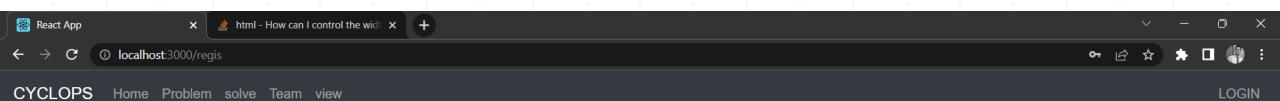
About

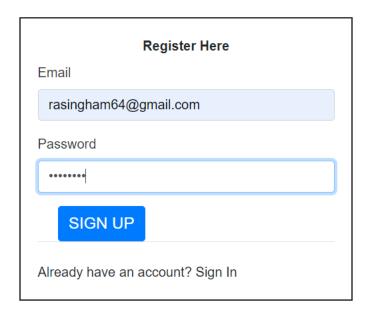
Cyclops is a software system for teaching LL(1) parsing. Cyclops provides an interactive environment to learn LL(1) parsing. It uses formal method techniques (i.e., SMT solvers) to give feedback to the user in case of wrong entries of the LL(1) parse table. Cyclops is built on the published work Parse Condition: Parsing Symbolic Encoding of LL(1)

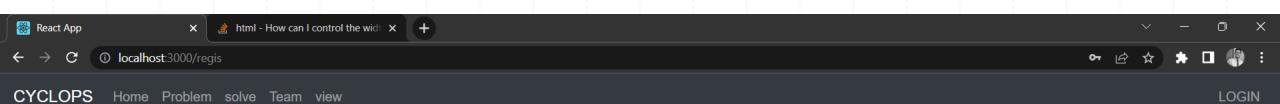
Publications

Dhruv Singal, Palak Agarwal, Saket Jhunjhunwala and Subhajit Roy. Parse Condition: Symbolic Encoding of LL(1) Parsing. Parsing

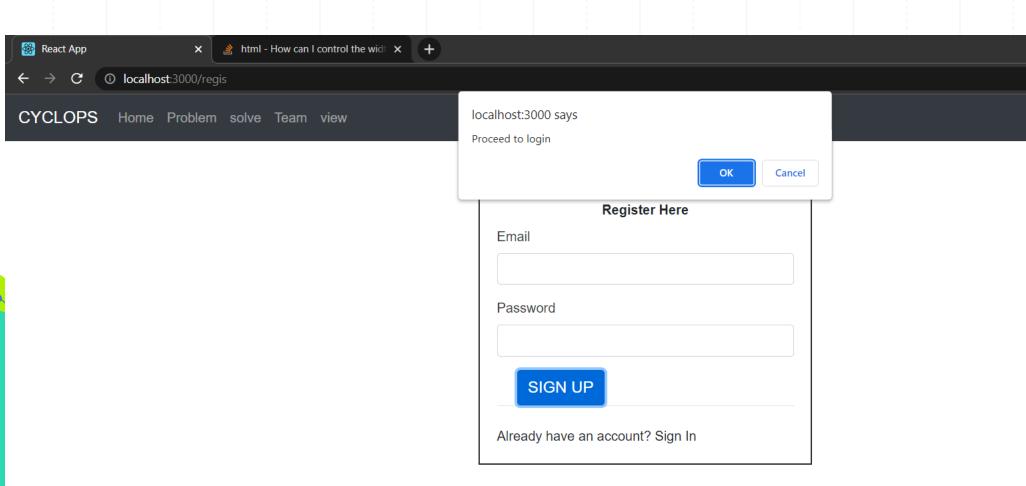
In LPAR-22. 22nd International Conference on Logic for Programming, Artificial Intelligence and Reasoning, Awassa, Ethiopia, 16-21 November. 2018.



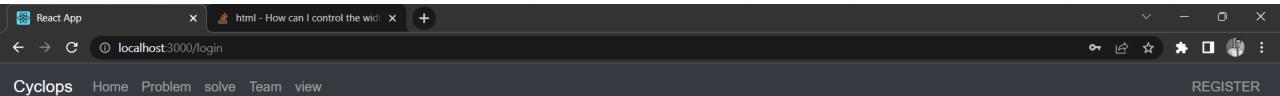


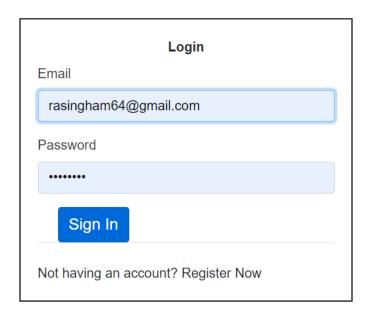


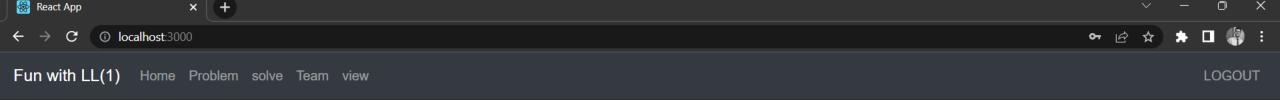
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CYCLOPS

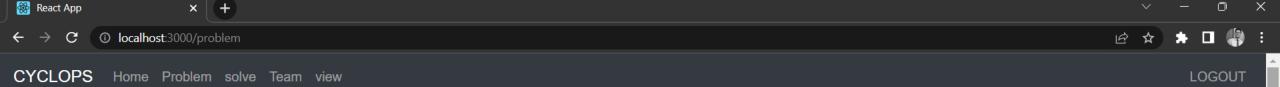
About

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Problem statement:

Your group was asked to create an LL(1) parser for a given grammar. As you were busy, your group members finished the assignment and sent the solution to you for verification. Clever you---you decided to use LL(1) parser generator to check the solution. But, to your dismay the constructed parse table is wrong!

Now, you know that your group members are careful, they could have created **exactly one error** while following the steps to LL(1) parser creation. To be more precide, they made a mistake in exactly one constraint of **first set**, **follow set** and **parse table** construction---at that too on a single non-terminal/terminal/production. You are required to locate the bug.

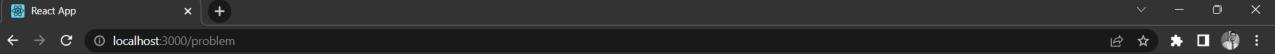
For your assistance, we have provided a bot, Cyclops ¹, that will help you debug the fault. Given a grammar and an incorrect parse table, it ranks the potential error and you may use it for directing your debugging effort. Like you, Cyclops does not have any idea of the error and hence, the actual fault may not appear at the top of the ranked list, or may not appear at all.

Your TA would have provided a passcode to access the site (and identify your group). You should attempt the Grammar/Tasks assigned to you (we have kept all tasks open, in case you want to explore other tasks too); however, only the tasks assigned to you will be graded.

We provide a possible sample solution that we expect from you: The error was in the second constraint of First Set construction corresponding to the non-terminal 'A'. The terminal 'b' was present as the first symbol in the body of production $A \to b A C$, and hence, should have been included in the first-set of 'A'. Adding 'b' to FIRST(A), adds $A \to b A C$ to the parse table corresponding to non-terminal 'A' and lookahead 'b'. This is the correct parse table.

You must provide an honest feedback about if Cyclops helped you solve the problem and how (about 50 words). We will grade you on the quality of this feedback. Please be honest; both positive and negative feedback is equally important to us.

Important: We intend to use your (anonymized) feedback in future publications. We assume that you provide your consent for the same when you provide feedback. In case you are not comfortable with the same, please send a mail to subhajit@iitk.ac.in and pkalita@cse.iitk.ac.in.



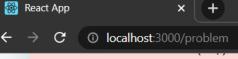
Constraints for parse table creation:

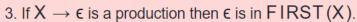
First set constraints:

- 1. If X is a terminal symbol then FIRST(X) = X.
- 2. If X is a non terminal symbol and $X \to Y_1, Y_2, \dots Y_k$ is a production, then If for some i, a is in FIRST(Y_i) and ε is in all of FIRST(Y_j) (such that j < i) then a is in FIRST(X_i). If ε is in FIRST(Y_i) ... FIRST(Y_k) then ε is in FIRST(X_i).
- 3. If $X \to \epsilon$ is a production then ϵ is in FIRST(X).

Follow set constraints:

- 1. Place \$ in FOLLOW(S), where S is the start symbol and \$ is the input right endmarker.
- 2. If there is a production $A \to \alpha B\beta$, then everything in F IRST (β) except ϵ is in F OLLOW (B) .
- 3. If there is a production $A \to \alpha B$, or a production $A \to \alpha B\beta$, where FIRST(β) contains ϵ , then everything in FOLLOW(A) is in FOLLOW(B).





Follow set constraints:

- 1. Place \$ in FOLLOW(S), where S is the start symbol and \$ is the input right endmarker.
- 2. If there is a production $A \to \alpha B\beta$, then everything in FIRST(β) except ϵ is in FOLLOW(B).
- 3. If there is a production $A \to \alpha B$, or a production $A \to \alpha B\beta$, where FIRST(β) contains ϵ , then everything in FOLLOW(A) is in FOLLOW(B).

Parse Table set constraints:

- 1. For each terminal a in FIRST (α), add A $\rightarrow \alpha$ to M[A, a].
- 2. If ϵ is in FIRST (α), then for each terminal b in FOLLOW (A), add $A \to \alpha$ to M[A, b]. If ϵ is in FIRST (α) and \$ is in FOLLOW (A) add $A \to \alpha$ to M[A, \$] as well.

1. Dhruv Singal, Palak Agarwal, Saket Jhunjhunwala and Subhajit Roy. Parse Condition: Symbolic Encoding of LL(1) Parsing. In LPAR-22. 22nd International Conference on Logic for Programming, Artificial Intelligence and Reasoning, Awassa, Ethiopia, 16-21 November. 2018. ↔

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Team



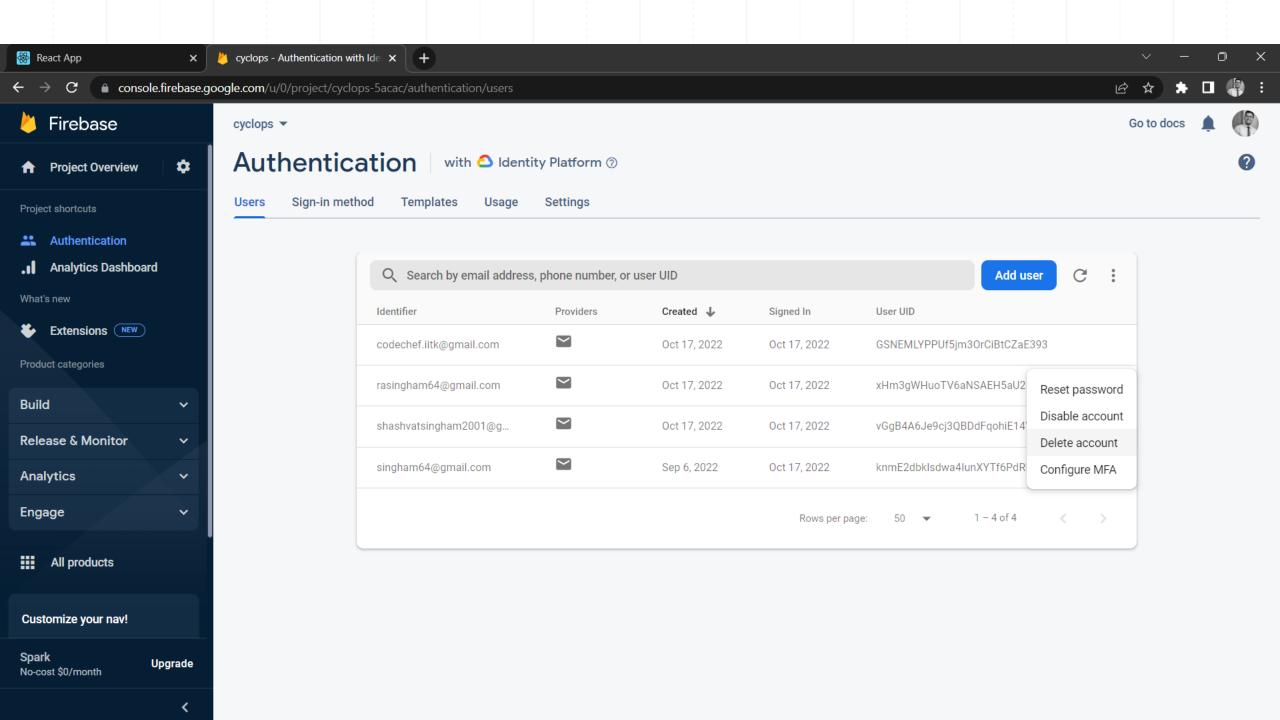
Pankaj Kumar Kalita PhD student

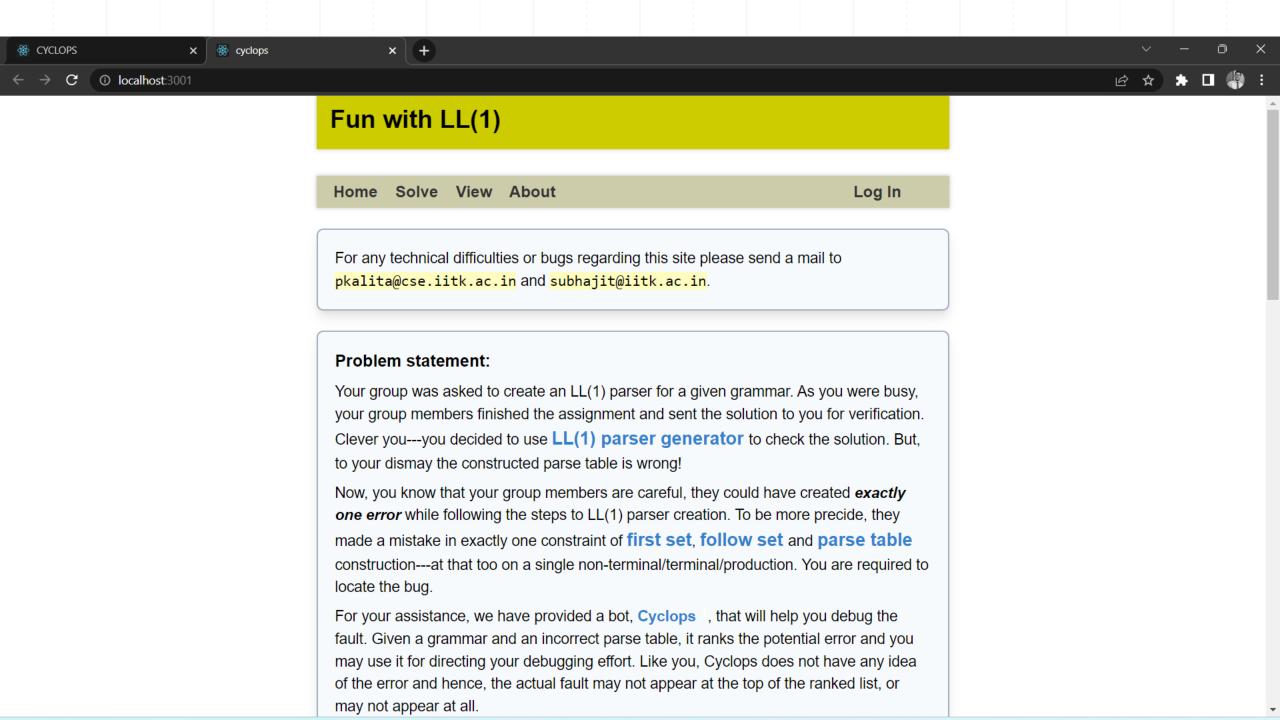


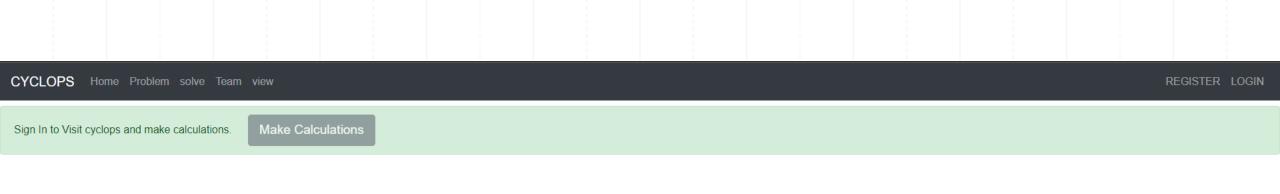
Sumit Lahiri PhD student



Dr. Subhajit Roy Associate Professor





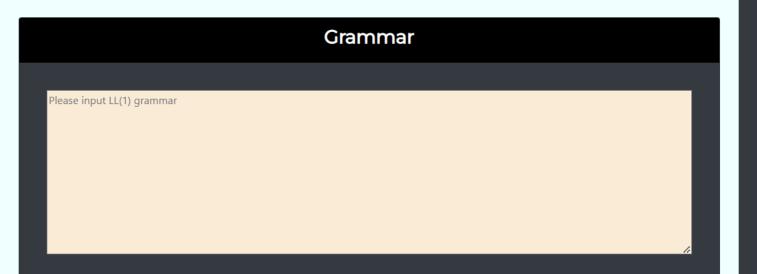


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You are Signed In.. Now you can enjoy cyclops.

Make Calculations

16



Generate Parse Table

First Set



Follow Set

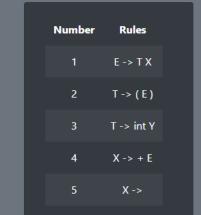


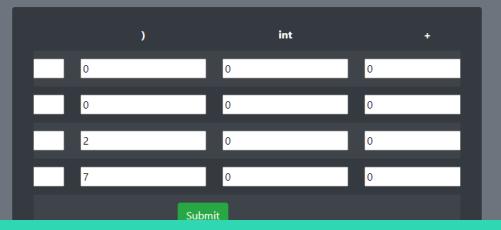
Parse Table Constraints

For each terminal a in $FIRST(lpha)$ $lacktriangledown$	
If ϵ is in $FIRST(\alpha)$ \blacktriangledown	

E-> TX T-> (E) T-> int Y X-> + E X-> eps Y-> * T Y-> eps

Generate Parse Table





First Set



Follow Set



Parse Table Constraints

For each terminal a in $FIRST(lpha)$ $lacktriangledown$
If ϵ is in $FIRST(lpha)$ ▼

