CPSC-406 Report

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Abstract

Short summary of purpose and content.

Contents

1 Introduction

2 Homework

This section contains solutions to homework.

2.1 Week 2

Exercise 2.3.2 - Convert to a DFA the following NFA

	0	1
→ p	$\{q, s\}$	$\{q\}$
*q	$\{r\}$	$\{q, r\}$
r	$\{s\}$	$\{p\}$
*s	$\emptyset$	$\{p\}$

The variables we have are Σ, q_0, Q and F. We need to find δ.

Σ: $\{0, 1\}$

q_0: p

Q: $\{p, q, r, s\}$

F: $\{q, s\}$

In order to make this NFA to DFA, we have to draw up a new table now, including the complete subset construction.

	0	1
$\emptyset$	$\emptyset$	$\emptyset$
$\rightarrow \{p\}$	$\{*q, *s\}$	$\{*q\}$
$\{*q\}$	$\{r\}$	$\{*q, r\}$
$\{r\}$	$\{*s\}$	$\{p\}$
$\{*s\}$	$\emptyset$	$\{p\}$
$\{p, *q\}$	$\{*q, r, *s\}$	$\{*q, r\}$
$\{p, r\}$	$\{*q, *s\}$	$\{p, *q\}$
$\{p, *s\}$	$\{*q, *s\}$	$\{p, *q\}$
$\{*q, r\}$	$\{r, *s\}$	$\{p, *q, r\}$
$\{*q, *s\}$	$\{r\}$	$\{p, *q, r\}$
$\{r, *s\}$	$\{*s\}$	$\{p\}$
$\{p, *q, r\}$	$\{*q, r, *s\}$	$\{p, *q, r\}$
$\{p, *q, *s\}$	$\{*q, r, *s\}$	$\{p, *q, r\}$
$\{p, r, *s\}$	$\{*q, *s\}$	$\{p, *q\}$
$\{*q, r, *s\}$	$\{r, *s\}$	$\{p, *q, r\}$
$\{p, *q, r, *s\}$	$\{*q, r, *s\}$	$\{p, *q, r\}$

$figure$: 2.1.1

In an NFA, there are N states from 2^N subsets in DFA. Since we have four states given to us, we have 2^4 subsets. To organize our new sets, we give them new labels to better keep track of them all.

New Label	Set
A	$\{p\}$
*B	$\{*q\}$
C	$\{r\}$
*D	$\{*s\}$
E	$\{p, *q\}$
F	$\{p, r\}$
G	$\{p, *s\}$
H	$\{*q, r\}$
I	$\{*q, *s\}$
J	$\{r, *s\}$
K	$\{p, *q, r\}$
L	$\{p, *q, *s\}$
M	$\{p, r, *s\}$
N	$\{*q, r, *s\}$
O	$\{p, *q, r, *s\}$

$figure$: 2.1.2

To keep it simple, the $\emptyset$ will still be $\emptyset$ in our translation. The new Σ, q_0, Q, and F are listed below.

Q: $\{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O\}$

Σ: $\{0, 1\}$

q_0: A

F: $\{B, D\}$

Using the new labels in figure 2.1.2, we replace what we see in 2.1.1.

	0	1
$\rightarrow$ A	I	*B
*B	C	H
C	*D	A
*D	$\emptyset$	A
E	N	H
F	I	E
G	I	E
H	J	K
I	C	K
J	*D	A
K	N	K
L	N	K
M	I	E
N	J	K
O	N	K

$figure$: 2.1.3

To better understand this using a graphical depiction, this is a map of the δ.

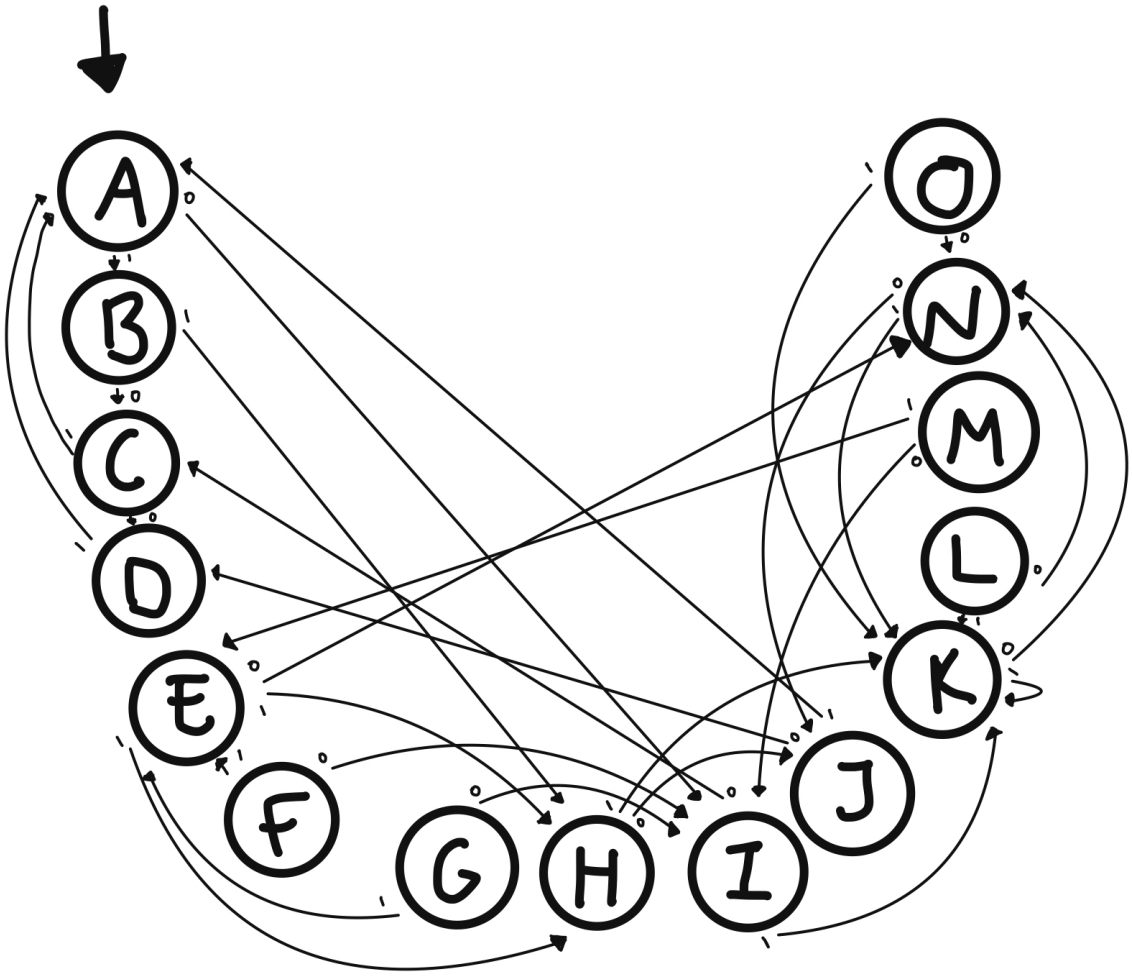

Figure 1: Graphical Depiction - Week 2 Example

2.2 Week 3

Question 1: Write down the steps taken by the unification algorithm for each of the following pairs of terms. If the algorithm succeeds, then write down the MGU and the corresponding common instance.

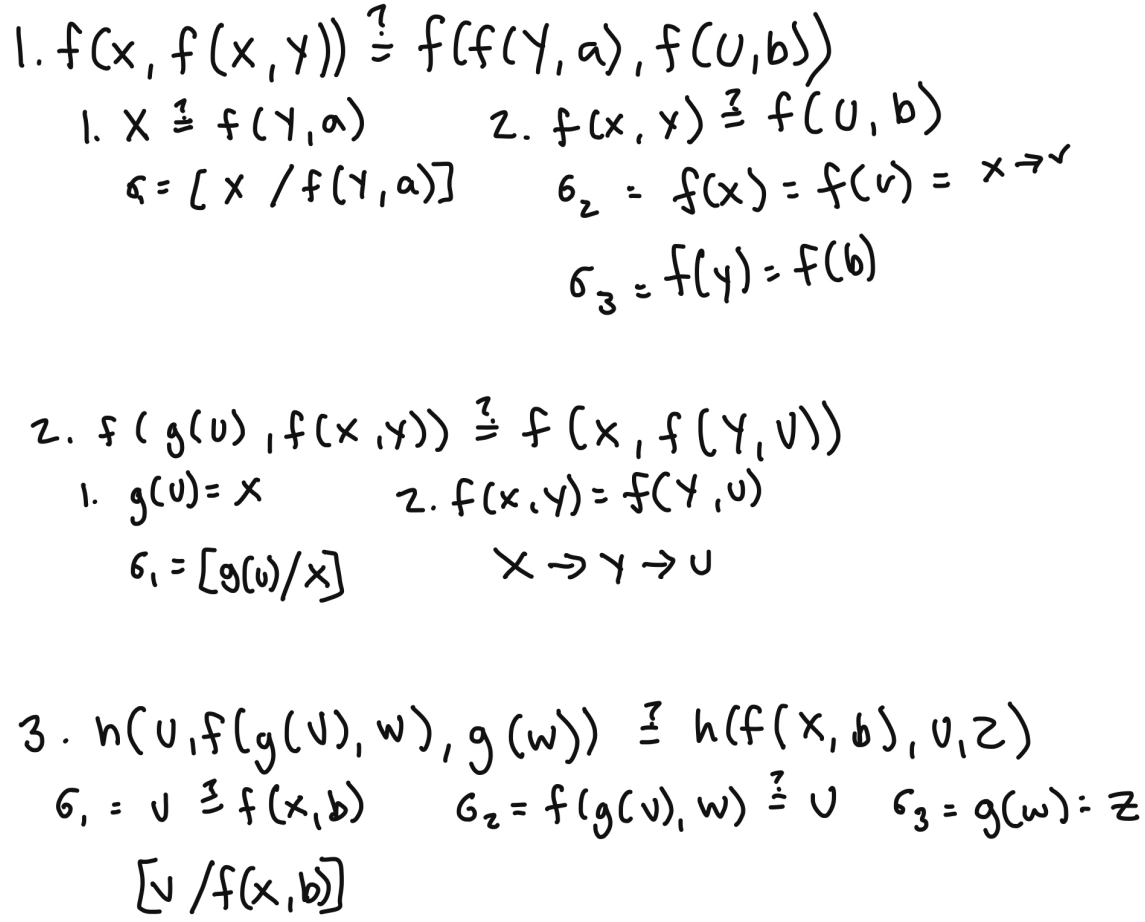

Figure 2: Unification Algorithm - Week 3 Question 1

Question 2: Consider the following variant of the network connection problems.

2.3 Week 4

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3 Paper

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4 Conclusions

(approx 400 words) A critical reflection on the content of the course. Step back from the technical details. How does the course fit into the wider world of software engineering? What did you find most interesting or useful? What improvements would you suggest?

```
% addr(X,Y) = X holds the address of Y
% serv(X) = X is an address server
% conn(X,Y) = X can initiate a connection to Y
% twoway(X,Y) = either end can initiate a connection

addr(a,d).
addr(a,b).
addr(b,c).
addr(c,a).

serv(b).

conn(X,Y):- addr(X,Y).
conn(X,Y):- addr(X,Z), serv(Z), addr(Z,Y).

twoway(X,Y):- conn(X,Y), conn(Y,X).
```

Draw the complete SLD-tree for this program together with the goal

```
?- twoway(W,a).
```

References

[ALG] Algorithm Analysis, Chapman University, 2023.

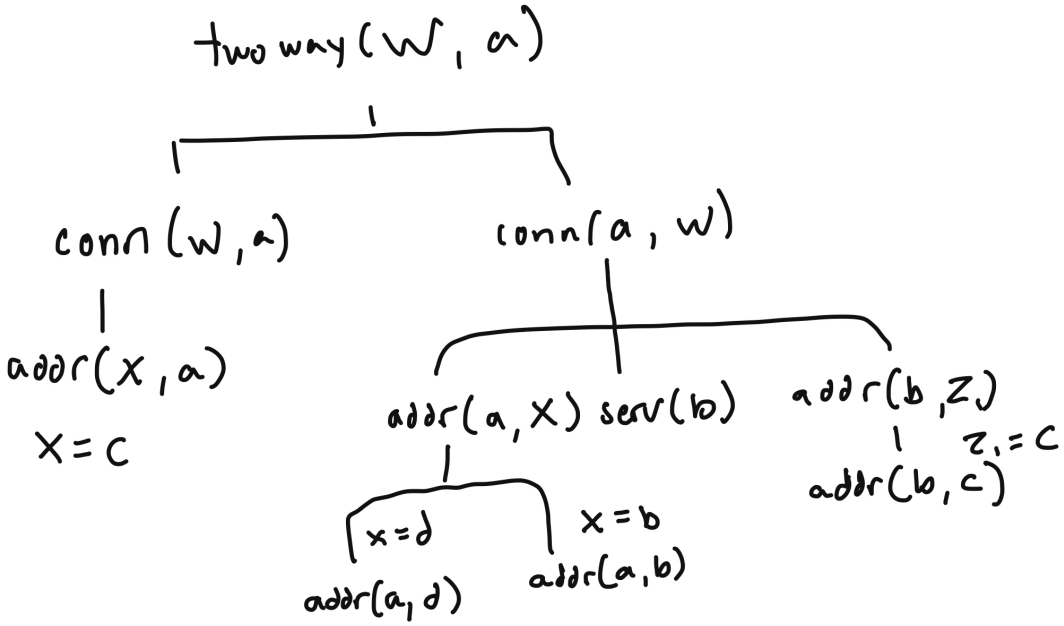

Figure 3: SLD Tree - Week 3 Question 1