**LAPORAN TUGAS**

**GOAL STACK PLANNING**

*Disusun untuk memenuhi tugas mata kuliah Kecerdasan Buatan yang*

*diampu oleh :*

*Untari Novia Wisesty, S.T., M.T*



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**JURUSAN S1 TEKNIK INFORMATIKA**

**FAKULTAS INFORMATIKA**

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**BANDUNG**

**2017**

1. **Deskripsi Masalah**

Pada kasus kali ini, diberikan suatu data Kurs Penukaran Mata Uang pada Tabel 1, di mana kurs penukaran dibaca dari baris ke kolom. Sebagai contoh, USD 1 = IDR 13.200, SGD 1 = IDR 9.450, GBP 1 = IDR 17.700, EUR 1 = IDR 15.100, IDR 1 = USD 0,0000788, dan seterusnya. Pada kasus ini diminta untuk mendesain Goal Stack Planning untuk menemukan urutan penukaran mata uang, dimulai dari IDR, kemudian ke sejumlah mata uang lainnya (masing-masing satu-dan-hanya-satu-kali penukaran), dan akhirnya kembali ke IDR yang menghasilkan keuntungan paling maksimum.

*Tabel 1. Kurs Penukaran Mata Uang*

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| **Kurs** | **IDR** | **USD** | **SGD** | **GBP** | **EUR** |
| **IDR** | 1 | 0,0000788 | 0,0001005 | 0,0000576 | 0,0000576 |
| **USD** | 13.200 | 1 | 1,3688889 | 0,7084746 | 0,7084746 |
| **SGD** | 9.450 | 0,6872727 | 1 | 0,5178814 | 0,5178814 |
| **GBP** | 17.700 | 0,7383051 | 1,8542857 | 1 | 0,8360452 |
| **EUR** | 15.100 | 0,8654305 | 1,5819048 | 1,5819048 | 1 |

1. Definisikan semua *state* (kondisi) yang ada pada kasus tersebut disertai penjelasan yang lengkap dan detail.
2. Definisikan himpunan operator yang berisi semua operator yang diperlukan disertai penjelasan yang lengkap dan detail.
3. Lakukan penelusuran *Goal Stack* *Planning*, disertai penjelasan yang lengkap dan detail, sampai dihasilkan urutan penukaran mata uang dimulai dari IDR, kemudian ke sejumlah mata uang lainnya (masing-masing satu-dan-hanya-satu kali penukaran), dan akhirnya kembali ke IDR yang menghasilkan keuntungan paling maksimum. Jika Si A memiliki uang tunai sebesar IDR 100.000.000 (seratus juta rupiah), berapa rupiah yang akan didapat Si A jika dia menukarkan semua uangnya dengan mengikuti urutan penukaran yang menghasilkan keuntungan paling maksimum tersebut?
4. **Pengerjaan kasus Kurs Penukaran Mata Uang**

**A. State**

Berikut ini adalah state yang digunakan pada pada kasus penukaran mata uang :

* OnTable(a) : Balok a sedang berada diatas meja.
* On(a,b) : Balok a berada diatas balok b.
* Clear(a) : Tidak ada balok diatas balok a.
* Holding(a) : Lengan robot sedang memegang balok a.
* ArmEmpty : Lengan robot tidak memegang balok apapun.

**B. Operator**

Berikut ini operator yang digunakan pada kasus penukaran mata uang:

* Stack(a,b) : Menaruh balok a diatas balok b.
* Pickup(a) : Mengambil balok a dari atas meja.

**C. Goal Stack Planning**

Mencari nilai maksimum penukaran mata uang dengan metode *brute force*.

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| **No** | **Urutan** | **Nilai** |
| **1** | **IDR-USD-SGD-GBP-EUR-IDR** | **70.532.107** |
| **2** | **IDR-USD-SGD-EUR-GBP-IDR** | **156.414.979** |
| **3.** | **idr-usd-gbp-sgd-eur-idr** | **80.953.272** |
| **4** | **idr-usd-gbp-eur-sgd-idr** | **69.773.805** |
| **5** | **idr-usd-eur-sgd-gbp-idr** | **80.953.275** |
| **6** | **idr-usd-eur-gbp-sgd-idr** | **154.753.080** |
| **7** | **idr-sgd-usd-gbp-eur-idr** | **61.776.756** |
| **8** | **idr-sgd-usd-eur-gbp-idr** | **137.016.556** |
| **9** | **idr-sgd-gbp-usd-eur-idr** | **41.108.674** |
| **10** | **idr-sgd-gbp-eur-usd-idr** | **35.673.767** |
| **11** | **idr-sgd-eur-usd-gbp-idr** | **56.484.088** |
| **12** | **idr-sgd-eur-gbp-usd-idr** | **80.239.186** |
| **13** | **idr-gbp-usd-sgd-eur-idr** | **45.523.308** |
| **14** | **idr-gbp-usd-eur-sgd-idr** | **45.039.627** |
| **15** | **idr-gbp-sgd-usd-eur-idr** | **78.528.889** |
| **16** | **idr-gbp-sgd-eur-usd-idr** | **63.188.140** |
| **17** | **idr-gbp-eur-usd-sgd-idr** | **53.911.876** |
| **18** | **idr-gbp-eur-sgd-usd-idr** | **69.109.159** |
| **19** | **idr-eur-usd-sgd-gbp-idr** | **62.549.877** |
| **20** | **idr-eur-usd-gbp-sgd-idr** | **61.885.288** |
| **21** | **idr-eur-sgd-usd-gbp-idr** | **78.528.892** |
| **22** | **idr-eur-sgd-gbp-usd-idr** | **45.987.832** |
| **23** | **idr-eur-gbp-usd-sgd-idr** | **87.023.932** |
| **24** | **idr-eur-gbp-sgd-usd-idr** | **153.278.944** |

Setelah menghitung nilai pertukaran mata uang, nilai tukar maksimal yang didapatkan yaitu sebesar Rp. 156.414.979 dengan urutan IDR-USD-SGD-EUR-GBP-IDR.

Berikut ini stack yang dibuat berdasarkan nilai tukar terbesar yang telah ditentukan sebelumnya,

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|  | IDR |  | USD |  | SGD |  | GBP |  | EUR |  | IDR |  |
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Current State : OnTable( IDR, USD, SGD, GBP, EUR, IDR ) ^ ArmpEmpty.

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Pickup(USD) :

P : OnTable(USD) ^ Clear(USD)^ArmEmpty

A : Holding(USD)

D : OnTable(USD) ^ ArmEmpty

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Stack(USD,IDR)

P : Clear(IDR) ^ Holding(USD)

A : On(USD,IDR) ^ ArmEmpty

D : Holding(USD) ^ Clear(IDR)

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|  | USD |  |  |  |  |  |  |  |  |  |  |  |
|  | IDR |  |  |  | SGD |  | GBP |  | EUR |  | IDR |  |
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Current State : OnTable(SGD, GBP, EUR, IDR ) ^ On(USD,IDR) ^ ArmpEmpty.

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|  | IDR |  |  |  |  |  | GBP |  | EUR |  | IDR |  |
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Pickup(SGD) :

P : OnTable(SGD) ^ Clear(SGD)^ArmEmpty

A : Holding(SGD)

D : OnTable(SGD) ^ ArmEmpty

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|  | IDR |  |  |  |  |  | GBP |  | EUR |  | IDR |  |
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Stack(SGD,USD)

P : Clear(USD) ^ Holding(SGD)

A : On(SGD,USD) ^ ArmEmpty

D : Holding(SGD) ^ Clear(USD)

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Current State : OnTable (GBP, EUR, IDR ) ^ On (USD,IDR) ^ On (SGD,USD) ^ ArmpEmpty.

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|  | USD |  |  |  |  |  |  |  |  |  |  |  |
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Pickup(EUR) :

P : OnTable(EUR) ^ Clear(EUR)^ArmEmpty

A : Holding(EUR)

D : OnTable(EUR) ^ ArmEmpty

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|  | SGD |  |  |  |  |  |  |  |  |  |  |  |
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Stack(EUR,SGD)

P : Clear(SGD) ^ Holding(EUR)

A : On(EUR,SGD) ^ ArmEmpty

D : Holding(EUR) ^ Clear(SGD)

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Current State : OnTable (IDR ) ^ On (USD,IDR) ^ On (SGD,USD) ^ On (EUR,SGD) ^ ArmpEmpty.

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Pickup(GBP) :

P : OnTable(GBP) ^ Clear(GBP)^ArmEmpty

A : Holding(GBP)

D : OnTable(GBP) ^ ArmEmpty

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|  | EUR |  |  |  |  |  |  |  |  |  |  |  |
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Stack(GBP,EUR)

P : Clear(EUR) ^ Holding(GBP)

A : On(GBP,EUR) ^ ArmEmpty

D : Holding(GBP) ^ Clear(EUR)

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Current State : OnTable (IDR ) ^ On (USD,IDR) ^ On (SGD,USD) ^ On (EUR,SGD) ^ On (GBP,EUR) ^ ArmpEmpty.

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Pickup(IDR) :

P : OnTable(IDR) ^ Clear(IDR) ^ ArmEmpty

A : Holding(IDR)

D : OnTable(IDR) ^ ArmEmpty

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Stack(IDR,GBP)

P : Clear(GBP) ^ Holding(IDR)

A : On(IDR,GBP) ^ ArmEmpty

D : Holding(IDR) ^ Clear(GBP)

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Final State : OnTable (IDR ) ^ On (USD,IDR) ^ On (SGD,USD) ^ On (EUR,SGD) ^ On (GBP,EUR) ^ ON (IDR,GBP) ^ ArmpEmpty.