
Istanbul Technical University - Computer Engineering

BLG 458E - Functional Programming

Homework 3

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Deadline: 07.06.2025

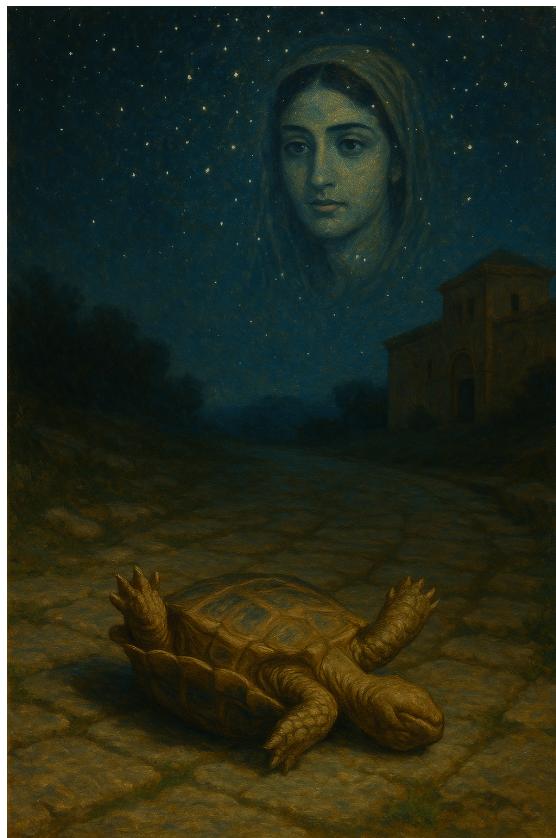


Figure 1: Abdullah's death.

After a while, Yakup Bey reached once more over the fence and grabbed Abdullah. Holding the tortoise in his hand, he approached İğdişbaşı. Upon seeing Yakup Bey's grin, with its gaps from missing teeth, Abdullah cursed him inwardly in the tongue of beasts and retracted into his shell. Yakup Bey's head was already spinning from Lale's scent. He had no mind for the animal or the drawing on the floor.

"Ah, man!" he thought. "Why must you thrust this bald-headed creature into my view where Lady Lale gleams like a star?"

Still, he stood, wearing his dominion like a robe on his face, and began to circle the pattern on the ground, examining it closely. The motif was truly flawless. But Yakup Bey was determined to play hard to get.

"By God, Seymur Efendi," he began, "you've poured your time into feeding and teaching this beast. And for what? It's not even good to eat. Couldn't serve in battle either..."

He fixed his gaze on Seymur Efendi, pacing slowly about the room. He didn't watch his step,



he never had to. Wet ink from Abdullah's drawing stuck to the bottom of his shoe. As İğdişbaşı rambled on with pompous declarations, both Seymour Efendi and Lale had lowered their heads, eyes fixed on the footprints he left behind. The design Abdullah had drawn was slowly morphing with each tread of the İğdişbaşı's foot.

"I was considering a trip to Konya in the coming days. All right, I'll mention this animal to the Sultan. But... a few purses of gold just for drawing flowers on the floor?"

Seymour Efendi's eyes widened. In his excitement, he placed Abdullah on the floor without even removing the reed pen from his back. The animal took a few steps and began scribbling random shapes.

"Abdullah could even be used in state affairs. He knows both Arabic and Latin letters. Have him memorize a decree and send him far away—like a secret courier..."

"Oh, sir! Why didn't you show that to begin with? You truly have no sense for matters of state!"

Faced with this angry outburst, Seymour Efendi stood helpless. If only he too had a shell to tuck his head into...

What caught İğdişbaşı's attention instead was Lale, trembling like a child. To add to his already heavy-handed words, he moved to sit beside the girl again.

"This girl smells of flowers," he thought. "By God, she smells of flowers."

Then a thought came to him... One that would devastate Seymour Efendi even more.

"Well then, Seymour Efendi... Let's suppose the Sultan has written a royal decree and handed it to you. You've taught it to this animal and sent him off to the Fortress of Alanya. Have you ever even seen a royal decree in your life? A decree bears the Sultan's seal. It bears the word of God. And you would have all these sacred words drawn upon the ground by this wretched creature? Ah, if only you knew... If we brought this to a judge, what verdict do you think he'd pass on you?"

İğdişbaşı looked at the girl, then at her father. He had struck them both like a calligraphy brush splitting across the page. Now, they would accept whatever he said. He smiled.

"Seymour Efendi, you are at my fingertip... So mind what comes next. You must choose one of two paths. The first: kill this sin-tainted animal, though it would be a shame to waste your effort. The second: you must first learn protocol and etiquette. From me."

Seymour Efendi was about to say, "Of course, Yakup Bey, whatever you say," but Yakup Bey raised a hand to silence him.

"Etiquette... It's no simple thing to walk in and out of the palace. But my family has served the court for three generations. That's why the Sultan trusts me. So, if you truly wish to meet His Majesty, you must first meet me. I ask for your daughter, Lale, to be my wife."

Yakup Bey extended his hand toward Seymour Efendi—the verdict was now his. Seymour Efendi, drenched in sweat, cursed the day he had invited this man into his home. With a heavy face, he muttered:

"It is done, my lord," and shook Yakup Bey's hand.

Upon hearing all this, Abdullah trembled within his shell. Lale, the girl he loved... The one he had transformed into a tortoise just to see, was now to be married off by her father's will, and all because of his own gift. For six years he had roamed the world cloaked in a tortoise's skin, only to watch her from the shadows. He had died and come back to life seven times, just so a shaman would teach him the art of transformation.

Seymour Efendi and the İğdişbaşı left the room, still talking. Lale moved quietly from lamp to lamp, extinguishing the oil lights scattered around the room. The last one stood beside the enclosure. As she bent to blow it out, Abdullah saw her up close for the final time.

Once darkness fell, he was left alone among the foolish creatures, who shuffled and bickered with each other. A single hope stirred inside him. What if he escaped and found that old shaman



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again? What if he could do something, anything, to stop this marriage?

He slipped out through the gap beneath a broken slat of the fence. He moved toward the window, its curtains fluttering with the evening breeze. Then, with a great crash, he threw himself down.

He had landed on his shell. He twisted his head and flailed his limbs, but he couldn't turn over. As he felt blood seeping from his cracked shell, he gazed with full attention at the stars above.

Abdullah's final words were a poem, a soft lament carried on the wind:

*I once was flesh, then turned to shell
For one I loved, I walked through hell
Forgotten all the pain of Seymour's staff,
Still seeing your face on the stars as a graph.
This is not a poem, just an array of chars.
To simulate touching you, I'll touch the stars.*

Shortest Distance

Freebase, developed by Metaweb, was a large collaborative knowledge base consisting of data composed mainly by its community members. It was an online collection of structured data harvested from many sources. Freebase, was acquired by Google in 2010. Google utilized it to enhance its Knowledge Graph, improving search results with semantic information from diverse sources. In 2015, Google announced the discontinuation of Freebase.

Freebase consists of triplets, where each record shows two entities and the relationship between them. For example, the following record indicates that The Sopranos (`\m\0kfv9`) contains the actor Steven Van Zandt (`\m\0l1sq`).

```
/m/0kfv9 /tv/tv-program/regular_cast ./tv/regular_tv_appearance/actor  
/m/0l1sq
```

All entities are represented by MIDs, however multiple strings could be represented by the same MID if they direct the user to the same Wikipedia page. For example, for the searches "Erehwon Prison" and "Face/off", Wikipedia directs the user to the same page. In the following list, all strings used to direct the user to this page is given. In this homework, you can use only the first appearance.

```
/m/02_fz3      Erehwon Prison  
/m/02_fz3      Face/off  
/m/02_fz3      Face off (film)  
/m/02_fz3      Sean Archer  
/m/02_fz3      Castor Troy
```

With the homework document two different text files are given:

- **"mid2name.tsv"** contains MIDs and their textual equivalents.
- **"freebase.tsv"** contains the records for the relationship graph.

Write the Haskell code which finds the shortest distance between given two MIDs. Then, returns both the distance and the full path. If there is not a connection between the MIDs, it should throw an error.