Harvest 2018 Project Notes

Overview

- Track yield collections
- Help farmers optimise harvest yields.
- Help prevent theft.
- Manage admin (not a priority though)

Login System and Security

- Farmers log in with (Email or Google Sign In)
- Foreman must log in with phone numbers.
    - Are asked to select the farm they work for. If they don't work for any a message says they aren't in any farm. And must check with the farmer if his correctly added him in.
    - Phone numbers are stored in the database and not secured with database access rules. So we hash the numbers using SHA-256 2.
- Database is protected with read/write access rules.
    - A person may read/write inside a database field if that fields name is the same as their database UID.
    - A person may read/write inside a database field if their phone number is inside a field under the path `/foremen/{Phone Number}`

Yield Collector

- Tracks foreman location throughout a session. Can be viewed as a red line in the sessions view.
- Each time a "+" is pressed on a workers name, the date and location for that pickup is logged against that worker.

Information

- Primary purpose for information is for working with the rest of the system. We only require what is necessary for using the "Yield Collector", "Sessions" and "Stats"
- Required fields:

    - Farms:
    - name
    - Orchards:
    - name
    - assigned farm
    - Worker:
    - first name
    - last name
    - Foreman:
    - first name
    - last name
    - phone number
- Workers and foremen are all in the same view. Hence they must search "foreman" and "workers" to only show foremen and workers respectively.
- Search on mobile only does a string contains over multiple fields
- On web a search query is broken into 'tokens' split by spaces. Each token is then searched separately over the multiple fields.

Sessions

- Shows each sessions raw data.
- Orchard colours are determined by hashing their assigned farm into a hue between 80 - 360 degrees. The saturation is determined by hashing the upper half of the orchards database id and the lower half of the id determines the brightness. Both are generate a value between 0.6 and 1.0.
- DSL query like language. Has same search functionality as Information search described above. But also supports 'functions'. Adding in a token like "average" will display the average bags collected per worker in the display list.
    - All Functions
    - average or avg
    - sum or total
    - stddev or stdev
    - count or countWorkers
    - countOrchards
    - range
    - best or max
    - worst or min
    - duration or length
    - mode or common
- Time filters. To limit the sessions displayed to only within a certain time frame.

    - last # day(s)
    - last # week(s)
    - last # month(s)
    - today
    - yesterday
    - this week
    - last week
    - this month
    - last month
    - this year
    - last year
- Property filters. To only show query that match against a specific property simply add that property name in the query. For example "foreman name peter" will only show foreman that have the name peter.
    - All properties:
    - assigned orchard
    - company
    - crop
    - crop
    - cultivar
    - details
    - email
    - farm
    - farm company
    - farm email
    - farm name
    - farm nearest town
    - farm phone number
    - farm province
    - foreman
    - foreman assigned orchard
    - foreman id
    - foreman name
    - foreman phone number
    - id
    - irrigation type
    - name
    - nearest town
    - orchard
    - orchard crop
    - orchard cultivar
    - orchard irrigation type

    - orchard name
    - phone number
    - province
    - type
    - worker
    - worker assigned orchard
    - worker id
    - worker name
    - worker phone number

Stats

- Graph properties
    - Comparison: select one of:
    - Farm
    - Worker
    - Orchard
    - Foreman
    - Selection: select entities based on what was chosen in 'Comparison'
    - Time Period: is the step which to show amount of bags collected
    - Hourly
    - Daily
    - Weekly
    - Monthly
    - Yearly
    - Time Interval: From when to whens data must be shown.
    - Today
    - Yesterday
    - This Week
    - Last Week
    - This Month
    - Last Month
    - This Year
    - Last Year
    - Between Exact Dates. User must specify start and end dates.
    - Accumulation: how bags collected can be accumulated together.
    - None: No grouping takes place.
    - By Entity: sums the amounts of each entity on a specific date together
    - By Time: sums the amounts of each date together for each entity
    - Show Expected Lines: should the expected lines be displayed
    - Show Average Lines: should the average line be displayed

    - Line Type: how should the lines be displayed
    - Linear
    - Curved
    - Stepped
- Legend colours: each entities colour is determined by hashing their database ids. Colours generated are within the range (hue: 80-360 degree, brightness: 0.6 - 1.0, saturation: 0.6 - 1.0)
- Uses sine graph `a * sin(b * x + x) + d` to predict yield since it can model seasons.
- Get basic sine prediction using:
- Optimise sine graph with genetic algorithm
    - Chromosome: 4 floats to represent a, b, c and d.
    - Population: 100 chromosomes
    - Initialisation: random pool of genes within between the basic sine graph prediction values.
    - Selection: maintains best 100 chromosomes
    - Fitness function: mean squared error function
    - Crossover operator: uniform crossover
    - Mutation: uniform
    - Termination condition: 25 generations (why not until a certain error? server time is expensive)