Package 'EVchargcost'

Type Package

Title Computes and Plot the Optimal Charging Strategy for Electric
Vehicles

Version 0.1.0

Description The purpose of this library is to compute the optimal charging cost function for a elec-
tric vehicle (EV). It is well known that the charging function of a EV is a concave func-
tion that can be approximated by a piece-wise linear function, so big-
ger the state of charge, slower the charging process is. Moreover, the other important func-
tion is the one that gives the electricity price. This function is usually step-wise, since depend-
ing on the time of the day, the price of the electricity is different. Then, the problem of charg-
ing an EV to a certain state of charge is not trivial. This library implements an algorithm to com-
pute the optimal charging cost function, that is, it plots for a given state of charge r (be-
tween 0 and 1) the minimum cost we need to pay in or-
der to charge the EV to that state of charge r. The details of the algorithm are de-
scribed in González-Rodríguez et at (2023) <https://inria.hal.science/hal-04362876v1>.

License GPL-3

Language en-US

Imports ggplot2, cowplot

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R topics documented:

| minimum_cost | *Computes the minimum cost function* |

Description

Function that computes the minimal cost function for a given charging function (given by a, alpha and beta), an electricity price function (given by delta and gamma), a consumption tau and a range R

Usage

```
minimum_cost(a, alpha, beta, delta, gamma, tau, R)
```

Arguments

a	vector with the breaking points of charging function in the x-axis
alpha	vector with the slopes of the charging function on each segment
beta	vector with the y-intercepts of the charging function on each segment
delta	vector with the times duration of each segment of electricity price function
gamma	vector with the prices of the electricity on each segment of electricity price function
tau	consumption of the vehicle (numerical value)
R	range of the vehicle (numerical value)

Value

list with the x-values and y-values of the minimum cost function

Examples

```
a <- c(0,3.3,6.6,10)
alpha <- c(0.1757576, 0.07272727, 0.05294118)
beta <- c(0, 0.34, 0.4705882)
delta <- c(4, 3, 5)
gamma <- c(0.45, 0.25, 0.5)
tau <- 0.15
R <- 250
opt_cost_function = minimum_cost(a, alpha, beta, delta, gamma, tau, R)
print(opt_cost_function)
```

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plot_functions	*Plots the charging function, the electricity price function and the optimal cost function*

Description

Function that plots the charging function, the electricity price function and the optimal cost function

Usage

```
plot_functions(a, alpha, beta, delta, gamma, tau, R, x_values, y_values)
```

Arguments

a	vector with the breaking points of charging function in the x-axis
alpha	vector with the slopes of the charging function on each segment
beta	vector with the y-intercepts of the charging function on each segment
delta	vector with the times duration of each segment of electricity price function
gamma	vector with the prices of the electricity on each segment of electricity price function
tau	consumption of the vehicle (numerical value)
R	range of the vehicle (numerical value)
x_values	vector with the x-values of the breaking points of the charging cost function
y_values	vector with the y-values of the breaking points of the charging cost function

Value

A plot with the charging function, the electricity price function and the optimal cost function

Examples

```
a <- c(0,3.3,6.6,10)
alpha <- c(0.1757576, 0.07272727, 0.05294118)
beta <- c(0, 0.34, 0.4705882)
delta <- c(4, 3, 5)
gamma <- c(0.45, 0.25, 0.5)
tau <- 0.15
R <- 250
opt_cost_function = minimum_cost(a, alpha, beta, delta, gamma, tau, R)
xvalues <- opt_cost_function[["xvalues"]]
yvalues <- opt_cost_function[["yvalues"]]
plot_functions(a, alpha, beta, delta, gamma, tau, R, xvalues, yvalues)
```

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