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HP 41 PROGRAM SUBMITTAL FORM
PROGRAMMFORMBLATT/DOCUMENTATION DU PROGRAMME/GENERALITÀ SUL PROGRAMMA

Program Title
Programmtitel
Titre du programme
Titolo del programma

Theil's curve fitting

Category No. 304
Kategorie Nr.
Catégorie N°
Categoria N°

Name curvefitting/correlation/regression
Rubrik
Rubrique
Nome della categoria

No. of program lines 193
Anzahl Programmzeilen
Nombre de lignes de programme
N° di linee di programma

No. of data registers no. of datapairs
Anzahl des benötigten Datenspeicher
Nombre de registres de données
N° di registri utilizzati

Recommended HP 41 System configuration
Empfohlene System-Konfiguration
Configuration recommandée
Configurazione raccomandata

Port # 1 _____ Port # 2 _____
Port # 3 _____ Port # 4 _____

This program requires the following programs as subroutines:
Dieses Programm benutzt folgende Programme als Unterprogramme:
Ce programme utilise les programmes suivants comme sous-programmes:
questo programma usa i seguenti programmi come subroutines:

Program Name:
Programm:
Nom du programme:
Programma:

HP **Applications ROM**
HP Applications ROM
ROM d'application HP
ROM di applicazione HP

Program Abstract
Kurzbeschreibung
Résumé
Breve descrizione
del programma

This program fits a straight line through points by sorting the x,y datapairs, the slopes and the intercepts and taking medians.
With this method errors in high values counts as heavily as in low values, which isn't the case with the least square method. Erroneous data input correction is provided.

Program Size 046

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Name/Nom/Nome

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Ort
Localité
Città

Date 21-10-82
Datum
Date
Data

Signature
Unterschrift
Signature
Firma

PROGRAMMBESCHREIBUNG I
DESCRIPTION DU PROGRAMME I
DESCRIZIONE DEL PROGRAMMA I

Application, Equations, Variables
Anwendung, Gleichungen, Veränderliche
Application, Equations, Variables
Applicazione, Equazioni, Variabili

The datapairs are ranked in increasing order of the x values.

Than the slopes are calculated between the lowest datapair and the median +1 datapair, the slope between second lowest datapair and the median +2 datapair a.s.o.

After that the slopes are ranked in increasing order and the median is the estimate of the slope of the line of the best fit to the data. With this slope the intercept for each datapair is calculated.

(b=ax-y) These intercepts are ranked in increasing order and the median in the best fitting intercept.

Lit. Quick statistics

Peter Sprent

Penguin education 1981

page 227-229

Operating limits and Warnings
Grenzen und Einschränkungen
Limites et restrictions
Limiti operativi e avvertenze

In this program use is made of synthetic created memories. STO M, STO N and STO O. When this program is listed with the printer the printer will give other symbols.

Example
Beispiel
Exemple
Esempio

y	3.2	2.9	3.7	2.2	1.8	2.3	1.7	0.8	0.3
x	3	4	6	7	8	10	12	15	16

Calculation slope: $a_{16} = \dfrac{2.3 - 3.2}{10 - 3} = -0.1286$ $a_{38} = -0.3222$

Point (8, 1.8) isn't used $a_{27} = \dfrac{1.7 - 2.9}{12 - 4} = -0.1500$ $a_{49} = -0.2111$
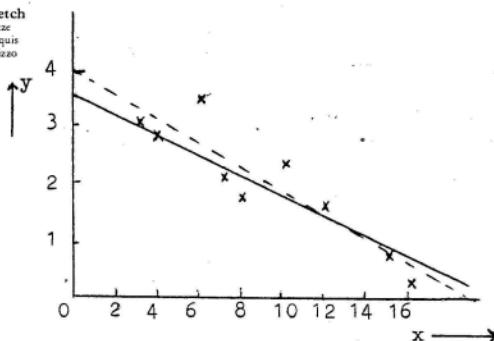
The median of these values is: $-0.2111 + -0.1500 /2 = -0.181$ $a = -0.181$

Calculation intercept: $b_1 = 3.2 + 0.181 \times 3 = 3.742$

After calculation and sorting the next results are obtained: (STO 00-STO 08)

3.189, 3.244, 3.464, 3.508, 3.622, 3.742, 3.867, 4.106, 4.783.

The median and the median +1 are the underlined values, the mean is 3.682

$b = 3.682$

To minimize the error the mean of the median and the median +1 is
calculated.

Sketch
Skizze
Croquis
Schizzo

Theil line (continuous) and least square line (broken).

(Example continued)
(Beispiel Fortsetzung)
(Exemple, suite)
(Esempio)

PROGRAMMBESCHREIBUNG III
DESCRIPTION DU PROGRAMME III
DESCRIZIONE DEL PROGRAMMA III

Data Input Dateneingabe Données Dati	Keystrokes Tasten Touches Tasti	Result Resultat Résultat Risultato	Comments Kommentare Commentaires Commenti
	XEQ THE	y , x	Enter y enter x
3.2	R/S		
3	R/S	1	
2.9	R/S		
4	R/S	2	
3.7	R/S		
6	R/S	3	
2.2	R/S		
7	R/S	4	
1.8	R/S		
8	R/S	5	
2.3	R/S		
10	R/S	6	
1.7	R/S		
12	R/S	7	
0.8	R/S		
15	R/S	8	
.3	R/S		
16	R/S	9	
	R/S		Start sorting
			You can follow the sorting
			in the display (bbh,eee)
		a=-0.181	Slope
	R/S	b=3.682	Intercept
			If you want to correct false
			data input, press a (Σ-)
			Only the last stored data can
			be corrected in this way.
			If you make an error with the
			y value and you have pressed
			R/S XEQ 09 to start again
If you want	to calculate	with the a a	nd b, you can store these
values in all	l memories af	ter line 142	.
STO 0 (line	142) contain	s the a	

Line / Zeile / Ligne / Linea	Keystrokes / Tastenfolge / Touches / Tasti	Comments / Kommentar / Commentaires / Commenti	Line / Zeile / Ligne / Linea	Key pressed / Tastenfolge / Touches / Tasti	Comments / Kommentar / Commentaires / Commenti
01	▵ LBL "THE"		51	1	
	CLRG			+	
	↑Y ↑X			RCL IND X	
	AVIEW			FRC	
05	PSE		55	X<>Y	
	CLA			RDN	
	▵ LBL 09			–	
	• CF 22			E5	
	STOP			x	
10	◂ FC? 22		60	RCL IND 0	
	GO TO 10 →			INT	
	STOP			RCL N	
	X<>Y			RCL 0	
	E5			+	
15	/		65	1	
	+			+	
	STO IND M			RCL IND X	
	ISG M			X<>Y	
	X<>X			RDN	
20	RCL M		70	INT	
	GO TO 09 →			–	
	▵ LBL 10			/	
	DSE M			STO IND M	
	RCL M			ISG 0	
25	E3		75	X<>X	
	/			GO TO 15 →	
	XEQ 11 ⇄			▵ LBL 26	
	FRC			RCL M	
	E3			RCL 0	
30	x		80	STO N	
	STO M			–	
	2			XEQ 11 ⇄	
	/			STO Y	
	INT			INT	
35	STO N		85	RCL 0	
	RCL M			2	
	+			/	
	E3			–	
	/			INT	
40	ST+M		90	STO Y	
	▵ LBL 15			1	
	ISG M			–	
	GO TO 22 →			RCL IND X	
	GO TO 26 →			RCL IND Z	
45	▵ LBL 22		95	+	
	RCL IND 0			2	
	FRC			/	
	RCL N			STO 0	
	RCL 0			RCL M	
50	+		100	RCL N	

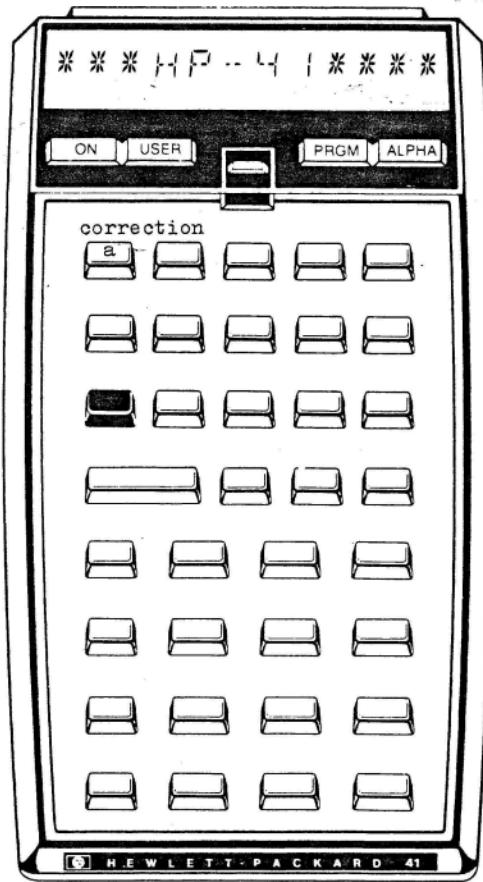| Line	Keystrokes	Comments	Line	Key pressed	Comments
01	-		51	STO M	
	1			STO Y	
	-			Δ LBL 01	
	INT			VIEW X	
05	E3		55	RCL IND X	
	/			Δ LBL 02	
	STO M			ISG Y	
	Δ LBL 40			GO TO 06 →	
	RCL IND M			GO TO 03 →	
10	STO Y		60	Δ LBL 06	
	INT			RCL IND Y	
	RCL 0			X<Y?	
	x			GO TO 04 →	
	CHS			RDN	
15	X<>Y		65	GO TO 02 →	
	FRC			Δ LBL 04	
	E5			X<>Y	
	x			STO IND Z	
	+			RDN	
20	STO IND M		70	GO TO 02 →	
	ISG M			Δ LBL 03	
	GO TO 40 →			STO IND M	
	RCL M			ISG M	
	INT			GO TO 05 →	
25	1		75	GO TO 30 →	
	-			Δ LBL 05	
	E3			CLST	
	/			RCL M	
	XEQ 11 ⇄			RCL M	
30	INT		80	GO TO 01 →	
	2			Δ LBL 08	
	/			RCL IND M	
	INT			STO IND T	
	STO Y			RDN	
35	1		85	GO TO 02 →	
	+			Δ LBL 30	
	RCL IND X			RCL M	
	RCL IND Z			← RTN	
	+			Δ LBL a	
40	2		90	DSE M	
	/			RCL M	
	RCL 0			GO TO 09 →	
	FIX 3		193	END	
	a=				
45	ARCL X		95		
	PROMPT				
	b=				
	ARCL Y				
	PROMPT				
50	Δ LBL 11		00		

REGISTERS, STATUS, FLAGS
REGISTERBELEGUNG, FLAGS, BETRIEBSARTEN
REGISTRES, INDICATEURS, MODES OPÉRATOIRES
REGISTRI, MODI OPERATIVI, FLAGS

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Registers Datenspeicher/Registres de données/Registri

00		50	
05		55	
10		60	
15		65	
20		70	
25		75	
30		80	
35		85	
40		90	
45		95	
		99	

Status Betriebsart/Modes opératoires/Modi operativi

Size	no $x_i v_i$	Total Reg.	046	User Mode
Eng ☐	Fix ☒	Sci ☐		On ☒
Deg ☐	Rad ☐	Grad ☐		Off ☐

Purpose
Bedeutung
Signification
Scopo

Flags

		SET	CLEAR	
00				
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11	Audio execute			
12				
13				
14				
15				
16				
17				
18				
19				
20				
21	Printer Enable			
22	Number Input	used		
23	Alpha Input			
24	Range Ignore			
25	Error Ignore			
26	Audio Enable			
27	User Mode			
28	Decimal Point			
29	Digit Grouping			

Assignments
Tastenbelegung/Assignations/Assegnamenti

Function	Key	Function	Key
Funktion	Taste	Funktion	Taste
Fonction	Touche	Fonction	Touche
Funzione	Tasto	Funzione	Tasto
last data input correction	a		

Assignments
Belegungen
Assignations
Assegnamenti

correction
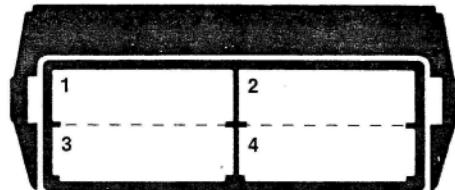
Configuration
Belegung
Configuration
Configurazione

Magnetic card
Magnetkarte
Carte magnétique
Scheda magnetica

1   3 sides   2