Notes

Bigram versatility and bigram frequency

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It has been widely demonstrated that anagram solution time may be affected by the frequency of the bigrams of the solution word. Recently (cf. Solso, Topper, & Macey, in press), bigram versatility, defined as the number of different words in which a given bigram appears, has been demonstrated also to play a significant role in anagram solution times. These two variables are seen as affecting total solution time in a nonindependent fashion, in that bigram frequency determines the set of words *S* searches for in memory and bigram versatility determines the size of the set of words through which *S* must search.

The present paper reports a data base from which solution anagrams may be constructed on the basis of both bigram frequency and bigram versatility. Table 1 presents the versatility and frequency counts of the bigrams AA through ZZ. Bigram versatilities were calculated from a 10% randomly selected group of words from a stratified sample of 10 successive items of the words throughout the Thorndike-Lorge (1944) word list of frequency one per million and over. Every bigram in the word used was recorded for its occurrence. Corresponding frequencies for the bigrams were selected from Underwood & Schulz (1960).

Table 1
Versatility and Frequency Counts of Bigrams (B) AA-MY*

B	V	F	B	V	F
AA	0	3	AN	181	3182
AB	54	639	AO	0	1
AC	60	1218	AP	38	703
AD	46	747	AQ	0	1
AE	1	6	AR	139	2389
AF	12	175	AS	61	1540
AG	36	588	AT	164	2363
AH	2	25	AU	22	362
AI	49	829	AV	20	479
AJ	1	147	AW	11	110
AK	18	439	AX	4	62
AL	152	1690	AY	17	198
AM	44	759	AZ	5	30

**V* = versatility, *NV* = 12,344 bigrams; *F* = frequency (Underwood & Schulz, 1960), *NF* = 1,000 words from T-L plus 15,000 words running text.

Table 1 Continued

B	V	F	B	V	F
BA	31	413	EP	23	320
BB	5	20	EQ	10	159
BD	2	1	ER	264	4034
BE	45	761	ES	129	2222
BI	21	234	ET	71	1268
BJ	0	7	EU	7	32
BK	0	1	EV	28	377
BL	62	747	EW	15	312
BN	1	1	EX	21	603
BO	31	404	EY	16	153
BR	31	197	EZ	0	35
BS	9	58	FA	21	420
BT	1	2	FB	0	2
BU	20	522	FE	22	712
BV	1	2	FF	18	328
BW	0	5	FI	37	721
BY	2	68	FL	17	148
CA	88	1055	FN	0	3
CC	9	225	FO	33	710
CE	68	1596	FR	22	303
CG	0	2	FS	0	6
CH	64	1297	FT	9	200
CI	47	603	FU	27	349
CK	36	676	FY	9	92
CL	24	648	GA	31	398
CO	109	1117	GB	0	1
CQ	2	1	GD	1	7
CR	36	432	GE	51	883
CS	0	5	GF	2	3
CT	46	607	GG	10	101
CU	29	459	GH	21	684
CY	15	77	GI	18	456
DA	28	342	GL	18	192
DB	1	1	GM	1	59
DD	11	75	GN	17	47
DE	119	1476	GO	23	164
DF	3	58	GP	0	5
DG	5	98	GR	38	490
DH	2	5	GS	3	64
DI	82	706	GT	2	112
DK	0	35	GU	17	127
DL	16	140	GY	10	59
DM	6	99	HA	55	1396
DN	4	56	HB	0	5
DO	29	397	HD	1	2
DP	2	2	HE	75	2897
DR	15	472	HF	4	4
DS	8	95	HG	0	1
DT	6	1	HI	54	1003
DU	20	165	HL	5	18
DV	4	83	HM	3	50
DW	1	29	HN	6	11
DY	9	152	HO	54	1129
EA	80	2516	HP	0	1
EB	9	26	HR	10	193
EC	54	729	HS	0	12
ED	88	1176	HT	17	496
EE	40	1046	HU	19	478
EF	25	201	HV	0	1
EG	21	295	HW	0	6
EH	4	54	HY	8	46
EI	10	397	IA	61	421
EJ	1	1	IB	17	80
EK	5	70	IC	105	1309
EL	100	1579	ID	48	495
EM	40	691	IE	40	670
EN	180	3203	IF	17	513
EO	12	89	IG	46	925

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Table 1 Continued

B	V	F	B	V	F
IK	3	49	MO	45	852
IL	67	1083	MP	38	382
IM	44	441	MR	0	11
IN	229	3902	MS	8	49
IO	126	1615	MT	1	1
IP	23	234	MU	14	148
IQ	5	13	MY	6	77
IR	37	1061	NA	65	637
IS	105	2051	NB	3	16
IT	114	1334	NC	62	795
IU	6	11	ND	77	1650
IV	46	594	NE	103	1689
IW	0	1	NF	19	124
IX	4	124	NG	91	1998
IZ	14	50	NH	5	18
JA	5	83	NI	60	574
JE	6	93	NJ	2	8
JI	2	2	NK	13	142
JO	6	204	NL	9	73
JU	8	163	NM	4	25
KA	6	51	NN	17	235
KB	2	7	NO	32	728
KD	0	2	NP	2	3
KE	44	828	NQ	3	69
KF	0	6	NR	3	26
KG	0	1	NS	55	466
KH	0	3	NT	158	2852
KI	12	205	NU	13	269
KL	6	34	NV	7	155
KN	6	88	NW	2	13
KO	2	13	NX	1	3
KP	0	1	NY	11	85
KR	1	9	NZ	1	5
KS	2	55	OA	17	66
KT	0	1	OB	19	121
KU	0	5	OC	22	578
KY	2	34	OD	25	304
LA	89	1307	OE	5	93
LB	2	14	OF	8	737
LC	5	55	OG	22	217
LD	22	682	OH	7	6
LE	168	2794	OI	14	113
LF	7	75	OJ	0	3
LG	2	17	OK	9	406
LH	1	1	OL	64	950
LI	99	1271	OM	45	740
LK	5	24	ON	220	3107
LL	82	1298	OO	46	716
LM	7	181	OP	24	268
LN	0	9	OQ	0	1
LO	64	1054	OR	149	2260
LP	8	175	OS	40	592
LR	2	6	OT	37	738
LS	10	227	OU	92	2118
LT	14	140	OV	23	766
LU	27	290	OW	36	676
LV	6	127	OX	4	38
LW	0	13	OY	1	111
LY	105	1100	OZ	1	5
MA	84	1210	PA	48	1098
MB	20	288	PB	1	4
ME	72	1161	PE	83	1263
MF	0	5	PF	0	14
MI	48	720	PH	29	157
ML	2	4	PI	30	281
MM	18	52	PK	0	1
MN	7	4	PL	30	498

Table 1 Continued

B	V	F	B	V	F
PM	1	12	TN	4	16
PN	0	1	TO	63	1213
PO	49	818	TP	0	1
PP	14	451	TR	66	1028
PR	65	840	TS	8	342
PS	4	32	TT	32	418
PT	13	283	TU	39	472
PU	50	220	TW	3	65
PY	3	72	TY	48	725
QU	31	430	TZ	0	4
RA	140	1488	UA	19	171
RB	9	70	UB	15	90
RC	13	515	UC	23	205
RD	31	354	UD	15	139
RE	210	3791	UE	17	320
RF	6	126	UF	6	171
RG	15	165	UG	15	249
RH	1	9	UI	24	244
RI	134	1515	UK	1	3
RK	7	250	UL	57	817
RL	19	277	UM	30	288
RM	18	365	UN	79	1147
RN	23	282	UO	5	37
RO	97	1721	UP	18	311
RP	12	28	UR	75	1304
RR	26	217	US	90	1079
RS	31	470	UT	34	1137
RT	57	687	UV	0	6
RU	30	140	UX	3	10
RV	10	137	UY	0	6
RW	3	51	UZ	0	7
RX	0	2	VA	26	379
RY	35	459	VE	104	2040
SA	37	566	VI	36	613
SB	1	21	VO	10	122
SC	36	329	VR	0	1
SD	1	1	VU	1	1
SE	90	1865	VY	0	12
SF	2	20	WA	27	723
SG	1	49	WB	2	6
SH	59	1203	WC	0	2
SI	76	1057	WD	2	117
SK	9	111	WE	15	779
SL	20	349	WH	14	700
SM	17	90	WI	18	338
SN	7	47	WK	1	4
SO	43	920	WL	6	17
SP	45	707	WM	1	1
SQ	3	12	WN	11	212
SR	0	1	WO	16	288
SS	83	1037	WP	2	1
ST	136	3473	WR	5	64
SU	40	598	WS	0	23
SW	7	100	WT	1	6
SY	9	180	WY	2	16
TA	88	913	XA	4	102
TB	1	5	XC	4	62
TC	10	163	XE	2	71
TD	0	2	XF	1	17
TE	174	2899	XH	0	3
TF	5	19	XI	6	120
TG	1	3	XL	1	10
TH	71	2879	XM	0	2
TI	189	2497	XO	1	1
TJ	0	1	XP	7	237
TL	20	639	XT	5	125
TM	12	63	XU	1	15

Table 1 Continued

B	V	F	B	V	F
YA	1	96	YR	8	23
YB	0	6	YS	10	56
YC	4	12	YT	3	17
YD	2	19	YV	0	1
YE	5	105	YW	1	19
YG	2	8	YX	0	4
YH	0	2	ZA	3	10
YI	3	64	ZE	14	88
YL	2	84	ZI	1	10
YM	3	33	ZL	1	4
YN	2	10	ZO	3	8
YO	6	251	ZY	2	7
YP	5	34	ZZ	2	9

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An on-off switch for solid state programming systems*

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One difficulty with some solid state programming systems is that modules (e.g., counters, lamp drivers, etc.) requiring both 28- and 12-V power must always have the 12 V applied before the 28 V. If 28 V is on without the 12, serious damage can occur to logic drivers and driven equipment, such as counters, since no bias exists to control the 28 V.

Figure 1 describes an inexpensive (approximately \$22) circuit which handles the problem and allows enough current to control large programming systems. Two buttons are employed. One button provides power (both 12 and 28 V) to the programming modules, the other turns the power off. Pushing the "on" button supplies 12 V first, then the 28 V. The "off" button turns 28 V off, and a few milliseconds later the 12 V disengages.

ON CYCLE: When the "on" pushbutton (S1) is depressed, Silicon-Controlled Rectifier SCR1 is gated to an "on" state. Consequently, Relay RY1 is energized, thus connecting the bias supply to the equipment. Also, the timing cycle on the unijunction transistor (Q1) is initiated. After a predetermined interval (R4, C2), the unijunction (Q1) gates Silicon-Controlled Rectifier

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Fig. 1. Circuit diagram for on-off switch to be used with solid state programming systems.

Table 1
Parts List

C ₁	.47 μF
C ₂ , C ₃	10 μF (see text)
D ₁ , D ₂	200 PIV, 1A
Q ₁ , Q ₃	2N2646 (unijunction)
Q ₂	2N1302 (bipolar)
R ₁	620 Ω
R ₂	1 K
R ₃	2 Ω
R ₄ , R ₈	39 k (see text)
R ₅ , R ₉	330 Ω
R ₆	200 Ω
R ₇	6.8 k
R ₁₀	10 Ω
RY ₁	24-V coil SPST 10A contacts
RY ₂	24-V coil DPDT 2A contacts
S ₁	SPST momentary action switch 24 V, 2A
S ₂	SPDT momentary action switch 24 V, 2A
SCR ₁	RCA C106B
SCR ₂	RCA C122D
T ₁	Pulse transformer 1:1 ratio

SCR2, which supplies power to the 28-V circuits.

OFF CYCLE: Depressing the "off" pushbutton (S2) initiates two simultaneous functions. First, the 28-V supply is disengaged. Second, the dropout relay timer is energized, which (1) maintains bias to the dropout circuit, (2) short circuits Silicon-Controlled Rectifier SCR1, and (3) disconnects the "on" timing circuit. All above functions are controlled by Relay RY2. The dropout timer, consisting of Transistor Q2 and Unijunction Q3, interval is determined by Resistor R3 and Capacitor C3. At the end of the predetermined timing interval, Transistor Q2 is switched to an "off" state, which in turn releases Relay RY2. This, in turn, releases Relay RY1, turning "off" the 12-V bias.

Diodes D1 and D2 suppress transient voltages (i.e., $L di/dt$). Also, Resistor R3 and Capacitor C1 insure voltage turn off on Silicon-Controlled Rectifier SCR1 (i.e., dv/dt).

Three circuits have been in use for 2 months without a failure.

Parts are listed in Table 1.

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